Colleges and the Changing Economy

Background Papers

VISION 2000

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and the
Changing Economy

Background Papers

Vision 2000
A Review of the Mandate of the Colleges of Applied Arts and Technology

VISION 2000

October 1989

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Vision 2000 is a review of the mandate of Ontario's Colleges of Applied Arts and Technology. It is coordinated by the Ontario Council of Regents and was initiated by the Minister of Colleges and Universities in October of 1988.

A Steering Committee, with broad-based representation, was established to guide the Vision 2000 process. Consultation, with a wide variety of stakeholders, and research was handled by five study teams. Study Team 1's task was to provide an empirical snapshot of the current college system and its external environment. Researchers from Study Team 2 examined the role of colleges in our changing economy, while Study Team 3 looked into ways that the college system could promote access and educational support for diverse learners. Study Team 4's purpose was to study the challenging interrelationships of quality, accessibility and efficiency. For Study Team 5 the research and consultation focussed on the linkages between colleges and other educational institutions.

The background papers in this volume are part of a number of publications by researchers prepared for Vision 2000. These papers do not necessarily represent the views of the Study Teams, the Vision 2000 Steering Committee, or the Ontario Council of Regents.

Together the background papers are meant to provide a broad base of ideas as part of the input for the deliberations of the study teams and the Steering Committee.

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Colleges and the Changing Economy

Background Papers

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Toward a Highly Qualified Workforce: Improving the Terms of the Equity-Efficiency Trade-Off

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David Wolfe

New Technology and Education: A Challenge for the Colleges

Peter Warrian

Industrial Restructuring, Occupational Shifts and Skills: The Steel and Electronic Manufacturing Cases

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Sandford Borins and Shirley Holloway

Meeting the Competitive Challenge: Enhancing Applied Research in Ontario's Colleges

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Pat Armstrong and Hugh Armstrong

Choosing Equity and Prospertiy: Access to College and the OntarioEconomy

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Role of the Colleges in the Changing Economy Report on Consultations

October 1989

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Colleges
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Changing Economy

Background Papers

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Toward a Highly Qualified Workforce: Improving the Terms of the Equity-Efficiency Trade-Off

Study Team 2

Toward a Highly Qualified Workforce:
Improving the Terms of the Equity-Efficiency Trade-Off

Summary

That the Canada-U.S. Free Trade Agreement will accelerate the restructuring of the Ontario and Canadian economies is not in dispute. There is, however, rather less agreement as to the kind of restructuring that should be encouraged and the kinds of policies required. In this paper it is argued that the current debate on restructuring constitutes a 'window of opportunity' for the Province, a chance to develop policies designed to improve the terms of the equity-efficiency trade-off by developing a highly qualified workforce. Although Vision 2000's mandate is to re-think the role of Ontario's community colleges, the recommendations it makes will have a far-reaching effect. The community colleges can be reorganized to fit into the 'hour-glass' society that is emerging to the south. This seems to be the direction currently favoured by federal policy. Alternatively, they can be structured to supply the workforce with the kind of skills required to revitalize the goods-producing sector and to promote the development of a high quality, dynamic service sector capable of paying good wages.

The first section of the paper surveys developments in the goods-producing sector and concludes by supporting the basic thrust of the Premier's Council's report, *Competing in the New Global Economy*. The second section takes a more careful look at the service sector, arguing that, if the community colleges are permitted to expand their programs for training para-professional workers, they can make an important contribution to the development of a dynamic, high-wage service sector. The third section critically examines the current federal training initiatives, while the last section tries to spell out the basic principles that should inform Vision 2000.

Vers une Main-d'œuvre Hautement Qualifiée par L'amélioration du Compromis Équité-efficacité

Sommaire

Nul ne conteste que l'accord de libre-échange entre le Canada et les États-Unis accélérera la restructuration économique en Ontario et au Canada. Le consensus est moins évident lorsque la question se pose de savoir quelle restructuration encourager et quelles politiques adopter à cette fin. Ce document soutient que le débat actuel sur la restructuration constitue pour la province une occasion idéale d'élaborer des politiques susceptibles de rééquilibrer les données du compromis équité-efficacité par l'essor d'une main-d'oeuvre hautement qualifiée. Vision 2000 a pour mandat de revoir le rôle des collèges communautaires de l'Ontario, mais ses recommandations auront une influence bien plus vaste. On pourrait envisager de réorganiser nos collèges communautaires de sorte à les adapter à la société qui prend forme chez nos voisins du Sud, où le secteur secondaire s'amenuise tandis que les secteurs primaire et tertiaire prennent de l'ampleur. Telle semble être la voie préconisée à l'heure actuelle par le gouvernement fédéral. On pourrait également envisager de restructurer les collèges de manière à équiper la main-d'œuvre des compétences nécessaires pour redonner vie à la production de biens productifs et de biens de consommation, tout en favorisant la prestation de services, dynamique et exemplaire, assortie d'une rémunération intéressante.

La première partie du document examine l'évolution récente du secteur secondaire et se rallie aux principes énoncés dans le rapport du Conseil du premier ministre intitulé *Concurrencer dans la nouvelle économie globale*. La deuxième partie offre une analyse plus approfondie du secteur tertiaire et défend le point de vue que les collèges communautaires pourraient jouer un rôle important dans la création d'un secteur tertiaire dynamique, où les salaires seraient élevés, si on les autorisait à assurer la formation de travailleurs para-professionnels. La troisième partie passe en revue les présentes initiatives fédérales en matière de formation, tandis que la dernière tente d'énoncer les principes fondamentaux dont Vision 2000 devrait s'inspirer.

"A well trained, well educated work force is the most important resource of our knowledge intensive service economy and is necessary to ensure our further progress and material well being. The real wealth of society today is knowledge." (*In Training, Only Work Works*. Report of the Senate Sub-Committee on Training and Employment, p. 3, December, 1987)

"Developing a strong dynamic human resource base is a precondition to sustained economic growth....One of the key competitive challenges Ontario faces is developing our most fundamental resource: the minds and skills of our workers." (*Competing in the New Global Economy*, Report of the Premier's Council of Ontario, Volume I, p. 215, 1988)

"Much of the pressure for industrial restructuring in Canada comes from **a rapidly changing world environment** characterized by increasing international integration and pervasive technological change. These trends have put stress on the labour market, creating an urgent need for streamlining of certain programs and new and innovative approaches." (*Working Together to Manage Change*, Report of the Business/Labour Task Force on Adjustment, Canadian Labour market and Productivity Centre, p. iii, 1989)

"From an economic point of view, there has been growing recognition that a skilled workforce is a key — if not **the** key — to competitiveness and growth." (*Adjusting to Win*, Report of the Advisory Council on Adjustment, p. 19, 1989)

"...the worsening of labour market problems...is indicative of the urgent need for a comprehensive national training strategy....**A training strategy that accommodates and enhances the contribution of all of the diverse components of the training marketplace — small and large — will have the best chance of producing a Canadian labour force equipped for the future.**" (*Skills for the Future*, Canadian Federation of Independent Business, p. 3, 1989)

"As with most issues surrounding technological change there is both a 'plus' and a 'minus' side associated with training. On the plus side is the increased corporate emphasis and commitment to training, as well as those few noteworthy initiatives that suggest the possibility of changing established patterns....On the minus side are all the indications which suggest that management will use training to shape the workplace in ways that unevenly distribute the benefits of new technology while unevenly sharing the costs." (*Technological Change in the Auto Industry*, CAW Technology Project, D. Robertson and J. Wareham, p. 50, 1987)

Table of Contents

Page

Introduction 1

Industrial Restructuring: Nature of the Choice 1

The Service Sector: Source of "McJobs" or ? 5

Fault Lines in the Canadian Jobs' Strategy 11

Shaping the Future: A Role for Ontario's CAATs 14

Conclusion 16

Introduction

Ontario's Colleges of Applied Arts and Technology (CAATs) were forged during the first great debate on the effects of automation. Then, as now, the coincidence of relatively high unemployment and skill shortages suggested that technological change was generating demand for skills different from those possessed by the unemployed. Policy renewal seems all the more urgent now, however, as pace of technological change is being accelerated by major changes in international economic conditions. The Japanese challenge, the rise of the newly industrialized countries (NICs), 'Europe 1992', and the Canada-U.S. Free Trade Agreement (FTA) give added force to the issues of restructuring and adjustment.

There is some concern that these challenges are producing a tension between the CAAT's twin objectives: to serve broader community needs, especially the promotion of greater equality; and to meet the needs of the labour market, thereby enhancing productivity and competitiveness. In other words, the adjustment imperative seems to require that equality take a back seat to efficiency. Restructuring is not, however, a linear process dictated by autonomous market forces. As this paper shall argue, restructuring can be directed in different ways, and it is possible to choose a path which will improve the terms of the equity-efficiency trade-off.

The choice can be put quite simply: Ontario can follow a development path that leads to increased skill and income polarization or opt for one that promises good jobs and rising incomes for all. Making the decision is, of course, more complex, involving as it does diverse public and private agencies, often with conflicting aims and objectives. Vision 2000 — which brings together representatives of many of these interests — constitutes a unique opportunity to begin to take hold of the future. The decisions that result — regarding the kind of education and training to provide, for whom, and under what conditions — will have an important bearing on the path taken. Simply put, the CAATs can be organized to supply technicians for an elite core of internationally competitive firms. Alternatively, they can become 'centres of lifelong learning, community development, and applied research."[1] It is the latter which seems the most promising from both an economic and a social point of view.

Industrial Restructuring: Nature of the Choice

In the debate on industrial policy, the choice has often been represented as one between protection of labour-intensive, 'sunset' industries like textiles and clothing versus policies to encourage the expansion of knowledge-intensive, 'sunrise' industries at home, while expediting the shift of older industries to countries enjoying a comparative advantage based on low-wages. Sometimes the second option is expanded to admit the possibility of automating production processes in 'mature' industries like automotives. In such cases, robots are expected to replace labour and thus counteract the comparative advantage enjoyed by low-wage countries. Put this way, the second alternative represents the only forward-looking option in the eyes of most people.

It is still easy to find examples of this kind of thinking as Canadians ponder their options in the post-FTA climate. Yet there is a growing recognition, in Canada and abroad, that this dichotomy fails to take into account the central 'revolutionary' features of the new wave of technological innovation. New technology, is of course, associated with the introduction of new products like VCRs and personal computers, as well as with the expansion of related services. Yet the really important contribution that microelectronics has to make is increasingly seen in terms of its potential to transform the very logic governing production.

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[1] *Only Work Works*, op. cit., p. 23.

That is, the wave of technological change that underlay the postwar boom emphasized 'economies of scale' — the mass production of standardized goods using dedicated equipment, deployed by semi-skilled assembly-line workers. The current wave of technological innovations opens up a new set of possibilities combining economies of scope — that is, the exploitation of the new technology's potential flexibility to produce a range of more custom-designed goods — and scale.[2] Successful pursuit of such a strategy, however, means breaking with the old dichotomy. As Cohen and Zysman note, 'there are no sunrise and sunset industries. There will be only those industries or firms that successfully incorporate the new potentials for product and production processes implicit in the new technology... and the firms that do not."[3] That is, if the new technologies are to generate the promised growth, policies have to be developed which promote the **diffusion** of new techniques to older industries, not the latter's demise. The Premier's Council of Ontario has recognized this: Competing in the New Global Economy argues strongly for policies that will help firms in 'mature' industries use the new technologies to move into high value-added production.

The effective exploitation of the new technologies, however, requires major social innovations, innovations which take into account the possibilities inherent in the new technologies. According to Freeman and Perez, the new 'techno-economic paradigm' includes the following features:

1. 'Horizontal integration' of the firm: a closer integration of functions like design, production, marketing, etc;
2. A new pattern of dynamic interdependence linking suppliers of equipment, components, and services; and assemblers;
3. New patterns of co-operation in research and development linking post-secondary institutions and firms, as well as the creation of 'strategic partnerships' among firms in order to discover ways of combining new technologies;
4. Infrastructual investment to facilitate the diffusion of new technologies throughout the economy (notably telecommunications); and
5. A new skill profile in the labour force — "increased demand for high level skills, reduced need for middle level management and some craft skills, and a greatly increased demand for multi-skilled "para-professionals."[4]

The new technology does not, however, create new institutions. Its core features fit better with some institutional complexes than others, but the way in which new techniques will be used is very much shaped by human choice, at the macro-societal level as well as at the micro level of the firm.

Thus societal choices will determine whether new technology is used primarily to enhance the power of large firms or whether it is also used to revitalize the operations of small and medium-sized firms. There is some evidence that new techniques are reinforcing regional disparities, as 'just-in-time' production and the concentration of specialized business services induce firms to locate near major centres.[5] Yet the geographical impact of restructuring need not exacerbate regional inequalities. The new communications technologies can be used to overcome the isolating effect of distance and, if efforts are made to strengthen local 'networks of innovation,' smaller centres can take on a new vitality.[6]

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[2] Michael Piore and Charles Sabel's *The Second Industrial Divide* (new York, 1985) constitutes the most dramatic and controversial statement of this position, but similar arguments had already begun to appear in the work of scholars like Christopher Freeman, Carlota Perez, Arendt Sorge, Wolfgang Streeck, and others. More recently, Stephen Cohen and John Zysman's *Manufacturing Matters* (New York, 1987) has excited the attention of North Americans.

[3] Cohen and Zysman, op. cit., p. 119.

[4] C. Freeman and C. Perez, "Long waves and changes in employment patterns," a paper presented at the ALC Conference on "Structural Change and Labour Market Policy," Saltsjobaden, Sweden, June 6-9, 1988, pp. 19-22. I have not included all ten features but rather have focused on those I thought the most relevant here. See Cohen and Zysman, chapter 11, for a good discussion of telecommunications' policy options. The business literature is rife with reference to the need for horizontal integration as well as the forging of new supplier-user linkages. Lynn Mytelka has done some excellent work on the forging of 'strategic partnerships' within the European Community.

The CAATs, which have campuses across the province, can make a contribution in both respects, especially if their (actual and potential) role in applied research is recognized.[7] The colleges, in other words, can come to form a vital component of local networks of innovation, along with universities, large and small businesses, unions, and community groups across the province. The CAATs most important contribution, however, is likely to remain in its traditional area of strength: the formation of skills.

There is some debate as to the kind of skills required to make the best use of the possibilities inherent in the new technologies. Increased skill polarization — the creation of high skill jobs for some, the deskilling of work on the shopfloor — is one of the possible consequences.[8] Yet skill polarization is most likely to take place within the goods producing sector when industrial policy favours high tech at the expense of 'mature' industries. The diffusion of new technology, as Cohen and Zysman argue, "turns on a broadly educated and skilled population."[9] German sociologist, Wolfgang Streeck, argues the case in even stronger terms.

For Streeck, what is required is:

> broad and unspecific skills; not just "functional" skills dedicated to a specific purpose, as they can be created by instant "refresher courses" or the replacement of one subject in the curriculum by another, but skills as a generalized, polyvalent resource that can be put to many different and, most importantly, as yet unknown future uses.[10]

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[5] See A. J. Scott, "Flexible production systems and regional development: the rise of new industrial spaces in North America and Western Europe," *International Journal of Urban Regional Research* 12:2, 1988, and Meric Gertler, "The Service Economy," *Manufacturing Matters: Conference Proceedings and Research Papers*, Industrial Development Institute, 1989.

[6] S. Lash and J. Urry (*The End of Organized Capitalism*, Polity Press, 1987) overstate the case that restructuring involves decentralization. While there was a move to decentralization in the seventies, recent trends in Canada and Sweden seem to point in the other direction. The Swedish white-collar unions (TCO), however, argue that the distance-shrinking effect of new technologies, the greater ease of informal contact across specialist lines, and value changes in favour of "quality of life" offer new opportunities for regionally balanced growth. See *Fackliga Strategier for Arbete Och Valfard*, 1989 TCO congress report, pp. 41-45. See, also, R. Lund and J. Rasmussen, "New Technology and Social Networks at the Local and Regional Level," *New Technology and Industrial Relations*, R. Hyman and W. Streeck, eds. Basil Blackwell, 1988.

[7] See Borins and Holloway in this volume. Their argument finds support in the results of research on state and local industrial policy initiatives in the U.S. See, for example, D. Osborne, *Economic Competitiveness: The States Take the Lead*, Economic Policy Institute, 1987.

[8] See, inter alia, A. Sorge, G. Hartmann, A. Warner and I. Nichols, *Microelectronics and Manpower in Manufacturing*, (Gower, 1983); R. Mahon, "From Fordism to ?", *Economic and Industrial Democracy*, 8:1, 1987; Freeman and Perez, op. cit.

[9] Cohen and Zysman, op. cit., p. 175.

[10] "Skills and the limits of Neo-Liberalism: the Enterprise of the Future as a Place of Learning," *Work Employment and Society*, 3:1, 1989.

In other words, the as-yet-to-be-fully-explored uses of new technology make the generalized provision of polyvalent skills the most rational course of action from the standpoint of society as a whole. The provision of this type of training, moreover, serves to improve the terms of the equity-efficiency trade-off: it enhances the capacity of firms to compete on the basis of quality, even while it reduces skill differentials by making possible a general reskilling of work. It should be noted, however, that such a broad education is required to get the most out of new production possibilities. It is not a substitute, but simply a better foundation, for on-the-job or more job specific 'competency-oriented' training.[11]

This view is supported by research done on human resource policy in Japan, Germany, and Sweden. A recent study of the Japanese auto industry draws a contrast between the latter, where work organization and training policy are designed to develop and tap the important incremental innovations that can come from the know-how accumulated on the shopfloor, and the 'fordist' paradigm dominant in North America and Britain in which innovation is largely seen as the prerogative of engineers and technicians in the R and D department.[12] Another comparative study of the deployment of numerically controlled machine tools in German and British plants (both large and small) shows a similar division, with the latter inclined to use the new technology in a way that increases skill (and income) polarization, whereas, in the former, new technology reduced the gap by raising the skill levels of shopfloor workers.[13]

Several recent studies suggest that firms in Canada are beginning to recognize that the successful application of new technology requires just such a reorganization of the labour process.[14] The CAW's studies of technological change in the auto and aerospace industries suggest that the companies have yet to work out a coherent strategy. Nevertheless, there is evidence that changes in the labour process demand of workers not only better basic academic abilities (the old 'three Rs') but also increased theoretical and analytical abilities. As one manager in the Canadian aerospace industry noted:

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[11] See the work of Dorothy Smith and George Smith, at the Ontario Institute for Studies in Education, on the development of competency based training for the plastics industry.

Streeck argues that firms must become centres of learning as well as places of production. I don't disagree for there is no substitute for experience, especially when jobs are designed to develop the capacities of those who do them. He goes further, however, to suggest that firms become the primary site for training, in a system overseen by the state and unions. While this accords with the thrust of federal policy (see below, section 3) such a position makes little sense in Canada where industrial training is really underdeveloped. Mixed programmes — apprenticeships, co-ops for the young; part-time work and part-time (paid), formal training for the existing workforce — make much more sense. I will return to this point in the last section.

[12] "Restructuring the capitalist labour process: some lessons from the car industry", R. Kaplinsky, *Cambridge Journal of Economics*, 12:4, 1988, especially pp. 460-461. While Japanese firms are correctly lauded for their recognition of the value of shopfloor experience, in large firms this has come at the price of the kind of paternalistic authoritarianism that would not be tolerated in countries like Canada. More broadly, the often touted benefits of lifetime employment and age related wages are largely confined to the core third of the workforce. See Mahon, op. cit.

[13] A. Sorge, G. Hartmann, A. Warner and I. Nichols, *Microelectronics and Manpower in Manufacturing*, (Gower Press, 1983). There is also a vast literature on Swedish experiments with work reorganization and it is usually cited as the country with the most developed public infrastructure for skills generation. The most interesting development, however, may be the most recent set of initiatives by the Swedish unions to push for the general "requalification of work" which may receive the support of a newly appointed government commission whose task it is to eliminate the 400,000 worst jobs. See *Det Utvecklande Arbetet*, LO, 1988, for a description of the blue collar unions' strategy. The documents prepared for the white collar unions' 1989 congress take a similar line.

[14] cf the CAW studies of technological change in the auto and aerospace industries; the report of the joint human resources committee of the Canadian Electrical and Electronics Manufacturing Industry, *Connections for the Future*, January 1989: and A. Yalnizyan and D.A. Wolfe, *Target on Training: Meeting Workers' Needs in a Changing Economy*, Social Planning Council of Metropolitan Toronto, 1989.

> "It's the difference between having a sense for something and understanding the theory behind it....(with electronics) there is a rigid set of rules that must be followed. If something doesn't work, you can't see, feel or hear it, you have to base your speculations on theory."[15]

The consultations carried out as part of Study Team 2's work also revealed strong support for the formation of generic skills, as well as increased stress on literacy and numeracy.[16]

If the strategy guiding the restructuring of Ontario's industries is based on the now outdated dichotomy — protection of sunset industries vs support for sunrise industries, plus the use of 'hard' automation to save some mature industries — equity will be sacrificed to efficiency, and polarization is the likely consequence.[17] If, however, the wider possibilities inherent in the new technology are recognized, equity and efficiency can simultaneously be served. The latter course, in fact, seems the more efficient in the long run, for new technology seem most likely to yield its maximum benefits if deployed by skilled workers on the shopfloor as well as in the design department. Success is also far more likely if the new 'techno-economic paradigm' is allowed to guide industrial and human resource policy. Fostering inter-industry linkages enables older industries to move up-market, where quality, more than price, determines competitiveness. In this part of the market, higher wage levels can also be sustained. Recognition of the innovative potential of skilled shopfloor workers also enables firms to develop the know-how required to sustain a competitive edge.

The report of the Premier's Council of Ontario, *Competing in the New Global Economy*, seems to favour the latter route. In calling for an industrial policy designed to steer restructuring in the direction of high value-added goods it recognizes that new technology can restore the competitiveness of the 'mature' industries that constitute the backbone of Ontario's economy.[18] It also recognizes the need for a complementary 'people strategy'. Ontario's CAATs are well positioned to contribute to a regionally-balanced, socially progressive version of the high value added strategy. They can contribute to the diffusion of new techniques by stimulating the formation of local networks of innovation in the communities of which they are a part. They are, moreover, uniquely well placed to provide the kind of polyvalent skills discussed above.

The Service Sector: Source of "McJobs" or ?

The discussion thus far has focused on the goods-producing sector, yet, during the eighties, service sector job growth in Canada and Ontario vastly outpaced the goods-producing sector. Between the end of the recession (1983) and 1987, the service sector accounted for approximately 90% of the net new jobs in the Canadian economy.[19] This does not mean that Canada has become a 'post industrial society.' Many of the services are directly dependent on the goods-producing sector, and most others depend upon revenues and incomes generated in the latter.[20] Nevertheless, the sheer weight of the service sector in the Canadian economy suggests that any restructuring strategy which focuses exclusively on the goods-producing sector cannot adequately come to grips with the policies needed to simultaneously serve the objectives of equity and efficiency.

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[15] Cited in *Technological Change in Aerospace: A Survey and Review*, Part I. Draft of CAW study on tech change in the aerospace industry, D. Robertson and J. Wareham, 1989.

[16] See A. Gill, "Role of the Colleges in the Changing Economy — Report on Consultations," Study Team 2, Vision 2000.

[17] Jobs in high-tech manufacturing can be quite polarized between an elite of engineers and technicians and a larger body of unskilled or semi-skilled assembly-line workers. See R. W. Rumberger and H. M. Levin, "Forecasting the Impact of New Technologies on the Future Job Market," Project Report N. 84-A4, Institute for Research on Educational Financing and Governance, Stanford University, 1984. The choice of "hard" (vs. flexible) automation similarly does nothing to overcome the existing polarization in mature industries like auto and may, indeed, intensify this. See W. Streeck, ed., *Industrial Relations and Technological Change in the British, Italian, and German Automobile Industry*, Wissenschaftszentrum.

[18] The report also recognizes that an active industrial strategy is required if innovation is to spread throughout the provincial economy. An innovative network needs, in many cases, to be created as, for historical reasons, the necessary inter-industry linkages are weak, if not nonexistent.

Freeman and Perez, in fact, suggest that restructuring could result in a new dualism pitting elite workers in core high value added industries against the majority of workers confined to low-skill, non-unionized, frequently part-time jobs — often filled by women and visible minorities — largely in the service sector.[21] Robert Kuttner's 'declining middle' thesis was based, in part, on the shift from relatively high-wage manufacturing jobs into the service sector, where skills and incomes tend to exhibit a greater polarization.[22] Similarily, Mike Davis' analysis of the emergence of a 'split level economy' in the United States emphasizes the concentration of job growth in three service industries — business services, fast food, and private health care — characterized by marked skill and income differentials.[23]

More recent analyses have highlighted differences within the service sector in terms of the quality of jobs provided and related income differentials. Such differences arise among the different branches of the service sector and within these.[24] In sectoral terms, a basic distinction can be drawn between producer services, consumer services, and social services.[25]

Producer services include transportation, communications, and utilities; wholesale trade; finance, insurance, and real estate; and services to business management.[26] As Gertler argues, this sector — especially finance and services to business management — has really expanded, partly as large companies responded to the recession in the early eighties by spinning off services formerly produced in-house.[27] This has had important side effects in that it has made it easier for smaller firms to get access to the kind of sophisticated inputs required to restructure their activities, at least in the greater Toronto area.

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[19] *Labour Research Notes*, No. 2, July, 1988, Canadian Labour Market and Productivity Centre or CLMPC.

[20] Cohen and Zysman, op. cit. For a nice analysis of the relation between goods and services, in the context of Metropolitan Toronto, see M. Gertler, op. cit.

[21] op. cit., p. 36.

[22] R. Kuttner, "The Declining Middle," *The Atlantic Monthly*, 1983.

[23] M. Davis, "The Political Economy of Late Imperial America," *New Left Review*, 143, 1984. See also Emma Rothschild's, "The Reagan Economic Legacy," *New York Review of Books*, July 21, 1988, for more recent data supporting Davis' analysis.

[24] See G. Esping-Andersen, "Post-Industrial Employment trajectories: Germany, Sweden, and the United States," paper prepared for the ECPR workshop on comparative political studies, Amsterdam, April, 1987; J. Myles, "Decline or Impasse? The Current State of the Welfare State," *Studies in Political Economy*, 26, 1988; and A. Jackson, "The Rise of the Service Sector and the Quality of Jobs: A Labour Perspective", *Labour Issue Papers*, December 3, 1988.

[25] Robert Reich would divide the services somewhat differently into symbolic-analytic services provided by professionals; routine production services (manufacturing and information storage retrieval); and routine personal services (cabbies, restaurant and hotel workers, cleaners, child-care workers and security guards). Only the first offers relatively high pay. The second is seen to be a declining group within the U.S. economy, while the latter are a rapidly expanding part of the workforce. Cited in Valpy's column, *Globe and Mail*, May 5, 1989.

[26] The latter includes such diverse services as consulting, design and engineering, advertising, accounting, data processing, marketing, building maintenance, security, and catering.

From the standpoint of the kind of jobs created and the structure of income associated therewith, the producer service sector is divided. In the older transport, communications, and utilities division, where jobs are disappearing, the wage and skill profile is similar to that in manufacturing.[28] In the finance, insurance, and real estate division, the picture is more uneven. For instance, women constitute about three-quarters of the labour force in Canada's major banks, but most hold clerical positions — a low-wage section likely to be adversely affected by technological change. Others are in the administrative support category, but the wage gap between them and the predominantly male senior managers is significant.[29] As Table 1 (see Appendix) shows, however, the most polarized division is services to business management, which includes high-wage jobs in design and engineering, advertising and accounting and low-wage jobs in data processing, security services, and catering.

The older, high-wage divisions of the producer-services sector represent a declining share of employment. New growth is concentrated in finance and services to business management. The latter's growth is important to the dynamism of the goods-producing sector. It also provides a number of good jobs and can do even better in this regard if societal pressures exist which move the industry in a more egalitarian direction. Wages are most likely to be directly affected by unionization, while job structures are also influenced by other factors, including the supply of highly qualified workers.[30]

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[27] Gertler, op. cit. Radwanski's study of the expansion of industrial design services also stresses the role of increased supply of industrial designers produced by Carleton University, the Ontario College of Art, and Humber College — a version of Say's law which certainly speaks for a pro-active role on the part of the CAATs and universities. See Radwanski's study for the Ontario government, *The Service Sector, 1986.*

[28] Data drawn largely from A. Jackson, op. cit.

[29] In 1984, the average salary for support staff was $19,000 per annum, while senior management averaged $57,000. See Radwanski, op. cit. Radwanski's report also noted that clerical positions were expected to decline to 60 percent by 1995 while managerial, administration, and related positions were expected to grow to 30 percent. (p. 99) If more clerical positions are turned into part-time employment, and, if growth in the upper tier is concentrated in administrative support positions, however, the wage and salary structure is likely to become more polarized.

Greater polarization need not, of course, be the outcome. MacInnes' study of technological change in a large British bank found that new technology could have been introduced in a way that would have meant the upgrading of women's jobs, had the union pushed for this. J. MacInnes, "New Technology in Scotbank: Gender, Class and Work" in *New Technology and Industrial Relations*, R. Hyman and W. Streeck, eds. Basil Blackwell, 1988.

[30] As Cohen and Zysman note, "In the white collar industries, the introduction of office automation technology makes it possible for clerical workers to assume functions formerly reserved for professionals, but only if they are sufficiently skilled to use the new technology and sufficiently educated to understand the new functions." op. cit., p. 228.

Table 1 Wage Distribution in the Service Sector, 1986

Sector	Average Wage	<$6.95	$6.76 - 9.22	$9.23 - 11.87	$11.88 - 15.58	> $15.58
Transport, etc.*	$12.45	12.5	17.6	19.8	29.7	20.4
Finance	$12.24	8.9	30.2	25.1	16.1	19.7
Business Management.	$11.98	20.5	23.2	19.1	13.7	23.5
Retail	$8.57	43.3	23.4	13.7	13.3	6.3
Food & Accommodation	$6.40	68.4	16.8	8.2	4.0	2.7
Education	$14.48	8.7	10.8	17.0	23.0	40.2
Health & Welfare	$11.25	15.2	20.0	27.6	22.5	14.7
Public Admin.	$13.75	8.1	11.6	22.8	25.4	32.1
Manufacturing**	$11.70	17.1	19.9	22.1	24.4	16.5

* Transportation, storage, communications, wholesale trade.
** Resource-based manufacturing, where wages tend to be higher, is excluded.
Data taken from Tables 4, 6, and 8 in Jackson, op. cit.

Producer services, then, have an important contribution to make to economic growth, and they can be organized to do this in ways which also at least maintain the structure of income distribution characteristic of the postwar period. The main area of choice in service sector growth lies in the balance between the two remaining divisions — consumer services, and public and social services. Both have made a substantial contribution to job growth in Canada since 1983. Retail trade (20.1% of new jobs) and food and accommodation (17.1%) made the biggest contributions, followed by health and social services (11.4) and education and related services (8.6). Yet there is a substantial difference in the wage profiles of these two divisions, as Table 1 shows. Two-thirds of retail workers and 85% of those employed in the food and accommodation sector had average hourly incomes in the bottom two quintiles as opposed to slightly over one-quarter in health and welfare and less than one-quarter in education. Conversely, 40.2% of those in education and 23.5% of those in services to business management had incomes in the top quintile as compared to 6.3% in retail and 2.7% in food and accommodation. These earnings differentials reflect differences in skill distribution as well as differences in levels of unionization — high in the public sector services and especially low in retail trade, food and accommodation.

It would be a mistake, of course, to put all of the blame for the growth in income polarization on the shift from manufacturing to services, especially consumer services. Bluestone and Harrison's analysis of the growth of income inequality in the U.S. attributed only one-fifth of the increase to the shift from relatively egalitarian manufacturing industries to those parts of the service sector characterized by income polarization.[31] Similarily Myles, Picot, and Wannell's study of changes in the distribution of jobs on the basis of hourly wage rates in Canada between 1981 and 1986 indicates that only 22% of the growth in wage inequality could be explained by a combination of intersectoral and interoccupational shifts, while 75% was due to changes in wage distribution within occupations and industries.[32]

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[31] The remainder resulted from changes occurring within industries as a result of the restructuring of work (two tier wage contracts, the turn to part-time employment, etc.). See B. Bluestone and B. Harrison, "The Great U-Turn: An Inquiry into Recent U.S. Trends in Employment, Earnings and Family Income," a paper presented at the ALC Conference on Structural Change and Labour Market Policy, Saltsjobaden, Sweden, June 6-9, 1988.

Nevertheless, Myles argues, the choices that a society decides to make with regard to the kind of service sector growth it will encourage, will exercise a marked impact on skill and income polarization.[33] Here, Myles not only supports the distinction made by others between publicly provided social services and the 'fun, food, and wine' sector. He goes on to suggest that there is also a choice as to what kinds of skills are to be embodied in social services such as daycare — minimally trained 'child minders' or specialists in early childhood education, trained in the post secondary school system?

The choice in child care has its parallels in other social service fields, as the following example from the American 'War on Poverty' era suggests. In 1969, the American government introduced a program called 'New Careers' which was designed to train the low-waged or unemployed for paraprofessional jobs in understaffed public service fields like medical care, education, welfare, public safety, and neighbourhood redevelopment. The program offered a way of expanding services provided in a relatively cost-efficient way.[34] It simultaneously provided a higher level of training than most of the War on Poverty programs, often combining classroom and on-the-job training. In 1970, New Careers was replaced by another program which expanded the areas of public service on-the-job training and included support services such as daycare and transport for those hired, as well as opportunities for skill upgrading for those already employed in low-skill, public-sector jobs. An 1975 assessment found that they:

> had successfully moved a large proportion of their enrollees...into permanent, unsubsidized public jobs and had been responsible...for sizable gross earning gains for most participants....However, because neither program was large and funds were limited, the benefits obtained from these early counterstructural public sector employment programs in the form of reducing unemployment or increasing municipal services were minimal.[35]

This example suggests that this kind of program, which combines the restructuring of social services with the provision of opportunities for skill acquisition by disadvantaged groups, can create even more 'good' jobs — ones which require (or develop) para-professional skills — than a simple expansion of existing social services. In this context, the kind of job creation-cum-training program recommended by the Canadian Senate's Sub-Committee on Training and Employment seems a logical complement to an industrial strategy devoted to the development of high value-added manufacturing.[36] The American experience suggests, however, that if the purpose of such programs is defined primarily in terms of helping the 'disadvantaged' — as opposed to improving the quality, quantity, and efficiency of public services — then such programs are likely to be vulnerable to deficit-cutting measures.[37]

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[32] J. Myles, G. Picot and T. Wannell, "Wages and Jobs in the 1980s: Changing Youth Wages and the Declining Middle," Statistics Canada Research Paper Series, No. 17, 1988, p. 61. Workers under 35 — both male and female — bore the brunt of these changes for reasons too complex to go into here.

[33] "Decline or Impasse? The Current State of the Welfare State," *Studies in Political Economy*, No.26, 1988.

[34] That is, by making more use of **paraprofessionals** who are often able to perform certain tasks currently carried out by higher paid professionals. One example would be midwives who require less training than obstetricians but are quite capable of doing most pre-natal exams as well as performing normal births. The Swedish health-9 care system makes good use of midwives.

[35] J. Wegner Johnston, "An Overview of U.S. Federal Employment and Training Programs," *Unemployment: Policy Responses in Western Democracies*, J. Richardson and R. Henning, eds., Sage, 1984

[36] See *In Training, Only Work Works*, op. cit. In this report, the Senate Sub-Committee called for job creation plus training in areas like daycare, home care for the elderly, illiteracy eradication, environmental restoration and reforestation, low-cost housing and housing restoration.

The argument for an economic strategy which combines the kind of industrial strategy envisioned by the Premier's Council with the strengthening of the social service sector rests in part on social grounds. From the standpoint of increased equality, such a combination is clearly to be preferred to policies which effectively increase skill and income polarization. Yet the argument for such a policy combination also rests on economic or 'efficiency' grounds.

First, such a policy is likely to reduce problems of labour shortages. That is, as many now recognize, the baby boom is turning into a 'baby bust': the supply of young labour force entrants (15-24) has fallen from a high of 27% in 1974 to 20% in 1988. By the year 2001, it is expected to have dropped to 17%.[38] Social policies like universal daycare and home care for the elderly (a potential growth industry as the baby boom generation moves closer to retirement) would make it easier for women's labour force participation to increase as such domestic responsibilities continue to limit women's full-time participation in the labour force.[39]

Second, such a strategy would reduce barriers to adjustment constituted by the very realistic fear that loss of a relatively high-wage industry job means landing in the low-wage service sector.[40] Third, the creation of 'good', relatively high-wage service-sector jobs supports the growth of domestic demand for 'high value-added' goods and services by increasing the purchasing power of those employed in the 'untraded' sector of the economy — and a strong domestic market is a necessary aid to would-be exporters.

Finally, the provision of quality daycare on a universal basis constitutes a good investment in the future. Quality early child care, in other words, can make an important contribution to the elimination of adult illiteracy in the future.

Equity and efficiency, then, can simultaneously be served if policies are adopted that encourage the expansion in the social services in particular, while putting pressure on the producer and consumer divisions to upgrade their workforce and thus to reduce the tendency to income polarization. The CAATs can make a

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I do not mean to suggest that the 'fun' sector should be eliminated. The main thrust of the argument is that the balance should be tipped in favour of publicly provided social services. Other measures can be taken to reduce the tendency to polarization in the consumer-goods sector. Higher rates of unionization help but the colleges also have a role to play in providing skilled workers. For example, a federal study of the tourism industry noted that Canada lags far behind the U.S. in this area. (*Tourism Tomorrow*, cited in Radwanski, op. cit. p. 359) The CAATs are already playing a role here, training chefs, and managers in the areas of food, and accommodation, and travel consultants. Clearly, more could be done, and this may well happen, as the consultations with the hospitality sector showed a growing recognition of the need to improve wages, working conditions, and training. See Gill, op. cit.

[37] See below for a discussion of "the politics of polarization".

[38] *Adjusting to Win*, op. cit. p. 23.

[39] It goes without saying that measures will also have to be taken to encourage and support the entry of women into 'non-traditional occupations.'

[40] This kind of thing happened to former textile industry workers — not the highest paid among manufacturing workers — who lost their jobs as that industry began to restructure in the seventies. A substantial number of those who managed to find new jobs ended up with significantly lower wages. See R. Mahon, *Politics of Industrial Restructuring*, University of Toronto Press, 1984.

contribution here via training and even research support.[41] In all three divisions, the CAATs are particularly well placed to provide the para-professional skills required.

Fault Lines in the Canadian Jobs' Strategy

As was suggested at the outset, training has once again become a major issue in Ontario and across the nation. The basic thrust of our future policy is thus in question. This section will briefly review recent developments in this field, arguing that while there have been some moves in the right direction, the general thrust seems to favour polarization. And, as Wismer notes, there are signs that Canadian educational institutions are also moving in this direction.[42] As the previous sections have argued, however, equality need not be sacrificed in the name of efficiency. A sound training policy, devoted to the development of a highly qualified, flexible labour force, constitutes an important instrument for improving the terms of the equity-efficiency trade-off.

Training policy is one of those policy fields in which both the federal and provincial governments play an important part, and the CAATs have historically occupied a critical place in the delivery . Yet the federal government is the one that sets the tone, at least with regard to adult education,[43] and this is the area which is becoming all the more important due to the shrinking supply of young labour-force entrants. Federal policy has become subject to growing criticism on questions of quantity, quality, and access, from such diverse sources as the Senate Sub-Committee, the Federal Advisory Council on Adjustment, the CLMPC Task Force, the Federation of Independent Business, and the Social Planning Council of Metro Toronto.

Canada ranks seventh among the twenty two OECD countries in expenditures on adult education/training. We currently spend only 0.21% on labour market training for adults. Funding levels, moreover, have fallen, despite the increased need for active labour market measures.[44] As the Senate Sub-Committee noted, "in three years, funding, at the federal level of training and labour market adjustment has decreased by 32%, in 1984 dollars, much faster than unemployment, which has only decreased ...by 19% over the same period."[45] The proportion of the labour force enrolled in government sponsored training has halved since 1977-78.[46]

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[41] The potential research support function — in fields as diverse as waste disposal, housing, daycare, and aging — for the CAATs came out in a number of the consultations.

[42] S. Wismer, "Ontario's Community Colleges: Values for the Year 2000." Report by Study Team 3, July 1, 1989, p. 11.

[43] The entry of the federal government into the field of training essentially occurred in the sixties when labour-market policy came to be seen as an important component of global economic policy. The federal government's role focused on labour-force projections and the funding of training for those already in the labour-force. Thus, although the provinces retained primary responsibility for education, the federal government spends considerably more on training than the provinces. See Dupre et al for a detailed discussion of the formative period.

[44] As the Premier's Council Report noted, Ontario's share of funding for training was cut from the $2.1 billion allocated for 1987-88 to $1.4 billion for 1988-89. *Competing in the New Global Economy*, Volume III, p. 145.

[45] Senate, op. cit., p. 13.

[46] *Quarterly Labour Market and Productivity Review*, CLMPC, Spring 1989.

The funding cuts are not simply a budget-trimming measure but rather reflect a policy shift in the direction of 'privatization.' That is, the federal government is attempting to privatize both the **definition** of skill requirements and the provision of training.[47] Privatization gives cause for concern not purely on ideological grounds but rather for more substantive reasons.

First, most agree that the private sector in Canada does too little training. In 1987, private-sector expenditure was estimated to be as low as $1.5 billion — versus $80 billion in the United States, which itself devotes far fewer resources to on-the-job training than countries like Germany and Japan.[48] Industry-level training, like R and D expenditure, moreover, tends to be concentrated in a few firms.[49] The federal Canadian Jobs' Strategy is designed to induce the private sector to invest in human resources, and there have been some successes. Yet these are largely in 'knowledge-intensive' industries where firms have had to develop the capacity to anticipate future skill needs.[50] As Yalnizyan and Wolfe have argued, even the federal government's most recent initiative — the labour-force development strategy — fails to go far enough to overcome industry's historic reluctance to invest in training:

> Employers are no more compelled to provide training opportunities for their own workers, or for the unemployed, than before. The only difference is that Ottawa is devoting more resources to having employers define training needs for the economy. This is a recipe for moving the training system closer to meeting short-term, job-specific, skill requirements, rather than investing in people's long-term learning needs.[51]

In other words, the federal government apparently is unwilling to force companies to spend more on human resources.[52]

More importantly, the inducements offered by the government include no measures to guarantee the quality of training to be provided. The issue of the quality of training is, of course, not an uncontentious one. Yet enough has been written on the kind of skills required for both large and small manufacturers to make full use of the possibilities inherent in flexible automation to support the arguments of those who stress generic skills which provide workers with the analytical framework needed to 'learn on the job' and to adapt to future changes. This is also the message that came through very clearly in the consultations.

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[47] See, **inter alia**, the Senate Sub-Committee report, op. cit., and Yalnizyan and Wolfe, op. cit.

[48] Report of the Advisory Council, op. cit., p. 42.

[49] The Confederation of Independent Business takes issue with the indices used to measure firm-level training, arguing that these are biased against small business which do substantial on-the-job training. The latter is certainly not unimportant but is inadequate, for reasons to be argued below.

[50] CEIC has supported joint labour-management initiatives taken by the steel, electrical and electronic, manufacturing, and aerospace industries. See Warrian and Wolfe in this volume for more detail.

Even in countries like Germany, which are often held up as examples in terms of skill formation, it would seem that **forward** planning of skill needs is a recent development. See Andreas Hoff, *Assessing Investment-Related Medium Term Manpower Needs: A Case Study of the German Auto Industry*, Wissenschaftszentrum, 1984.

[51] 'Training the Jobless,' *The Globe and Mail* ,May 18,1989.

[52] This issue has been raised not only by academics and unions but by such sources as the Advisory Council on Adjustment which argues that companies should pay a 'training tax' if they do not do enough training. The CLMPC Task Force and the Joint Labour-Management Committee of the Electrical and Electronic Manufacturing Industry are both prepared to experiment with some form of grant-levy system.

Representatives of large firms and small, of unions, and of non-profit agencies all stressed the importance of generic skills. This does not mean that classroom learning is better than learning by doing: both are needed to teach the skills — analytical and practical — required. What is needed, then, is some mechanism to ensure that on-the-job training actually supplements — not substitutes for — the provision of core skills for the existing labour force as well as labour-force entrants.

In addition to the problems of the quantity and quality of training supplied by the private sector, there is also the question of access. The Advisory Council noted that private sector training tends to be directed at those who already have above-average level of education (and pay). A recent study by the Canadian Association for Adult Education found that, in 1985, less than 15% of the labour force received job-related training, and, of these, 86% received only limited, short-term training.[53] The CAW's studies on technological change also stress the problem of access, given the absence of a (negotiated and/or legislated) right to training for all.[54]

The second major criticism of federal policy is that it supports the 'politics of polarization'. The Canadian Jobs' Strategy, as numerous commentators have pointed out, is primarily oriented to the 'disadvantaged.' While, in times of restraint, the notion of 'targeting the needy' may sound appealing, it serves neither equity nor efficiency.

It is true that certain groups — women returning to the labour force, single mothers, Native people, immigrants whose native tongue is neither English nor French, youth who have not completed secondary school, the handicapped — require policies that address their particular problems.[55] Yet the current program fall short of such ambitions. As the Senate Sub-Committee noted, the eligibility requirements under the Job Entry and Re-Entry programs make it difficult for single mothers to take advantage of them. Many have to take or remain in low-wage, part time jobs as they cannot afford to wait until they qualify for such schemes.[56] Support levels in terms of daycare, travel allowances, etc., are, moreover, too low to help many of those most in need of retraining. Finally, 'special' programs can have the unintended effect of 'stigmatizing' the recipients. In the U.S. where labour market policy has for some time been focused on disadvantaged groups, studies have found that employers are less likely to hire those who have been through such programs than others with similar qualifications.[57]

If the CJS does little to help its intended beneficiaries, it is also remarkably shortsighted in that it virtually ignores those who will need retraining if they are to be able to retain — or obtain — good jobs in the future. The combination of federally funded programs focused on the disadvantaged, and privatization of training for the rest — without control over the quantity and quality of training, nor over access to training — is a recipe for failure on economic and political grounds. It will not provide the kind of labour force needed to produce 'high value-added' goods nor will it make possible the kind of service-sector development discussed above. It contributes, moreover, to the politics of polarization. As American labour market policy expert, Paul Osterman notes, such programs 'are seen as the special preserve of particular target or interest groups, They fail to address broad issues of national welfare and competitiveness and thus are limited in their appeal and inherently vulnerable."[58] Whereas universal programs tend to enjoy widespread support — viz., the opposition to cuts in family allowances or support for seniors — programs that focus almost exclusively on 'the needy' are easy targets by governments keen to cut deficits.

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[53] Cited in the *Quarterly Labour Market and Productivity Review*, op. cit.

[54] cf. *Technological Change in the Auto Industry*, op. cit.; *Computer Automation and Technological Change: Northern Telecom*, (1988); and the Study of Technological Change in the Aerospace Industry, currently in draft form.

[55] See Pat Armstrong and Hugh Armstrong, "Choosing Equity and Prosperity: Access to College and the Ontario Economy," by in this volume for a good discussion of the old and new needs of these groups.

[56] op. cit., p. 14.

[57] See P. Osterman, "The Possibilities of Employment Policy" in *Workforce Policies for the 1990s*, Economic Policy Institute, 1988, p. 48.

The federal government's stance is also creating pressure on the Ontario government to focus on meeting industry's future needs. As the Premier's Council noted:

> the federal government's predilection for using training as a tool to alleviate unemployment and improve access to the labour market by disadvantaged Canadians reaffirms the need for Ontario to set industrial development and economic growth as its primary objectives in developing training policy.[59]

In other words, if the federal government focuses on 'equity,' the province should focus on 'efficiency'. In this context, there is a real risk that the CAATs will come to be internally divided, providing remedial programs, with federal funds, for those destined to work in the low-wage economy and provincially funded spaces for a new, elite corps of technicians and para-professionals.[60]

Shaping the Future: A Role For Ontario's CAATs

It has been argued that the federal government's current policy — (inadequately funded) public programs for 'the needy,' laissez-faire for the rest — tilts training policy in the direction of polarization. It would be a mistake if the Ontario government were simply to react against this, leaving to the federal government concerns about equity and focusing primarily on meeting industry's declared needs. In the field of labour market policy, its role is to blend education and training in a manner designed to improve the terms of the equity-efficiency trade-off. Vision 2000's Study Team 3 has arrived at a statement of objectives which nicely captures the broader objectives that should guide Ontario's policy into the next century.[61] This section attempts to elaborate on this statement in light of the argument sketched in the first two sections.

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[58] Osterman, op. cit., p. 32.

[59] *Competing in the New Global Economy*, Volume III, p. 145.

[60] Another scenario is that private vocational schools, whose 'comparative advantage' is in short-term training (see background document on these prepared by Study Team 1), become the main suppliers of training for CJS target groups, while the CAATs develop close links with industry, tailoring their programs increasingly to the latter's declared needs — needs which are likely to underestimate the importance of 'polyvalent' skills due to the problem of poaching.

[61] S. Wismer, *Ontario's Community Colleges: Values for the Year 2000*, background paper, Study Team 3, Vision 2000, p. 2.

The first principle is that the CAATs should strive to impart technological literacy to youth and to adults enrolled in its programs. A group of Australian experts in this field define technological literacy as follows:

> A capacity on the part of citizens to comprehend the essentials of technological design and the motives for change. Such a literacy is a means of empowering them to play a meaningful role in the extensive processes of restructuring and reconstruction that lie ahead.[62]

This means that in addition to the 'three Rs,' the colleges need to provide an understanding of technology and its uses, including the potential social and human implications of technological change. Such a program nicely combines the two main aims of education: to enhance national economic performance ('efficiency') and to provide all citizens with the knowledge and confidence needed to participate fully in economic and community life ('equality'). It meets the objective of efficiency because a well educated workforce has the kind of 'polyvalent' skills not only to meet current workplace needs but also those of the future, in the service sector as well as in the goods-producing sector. It meets the objective of equality in that it counteracts the emergence of an 'hour-glass society,' where some enjoy stimulating, well-paid jobs while a large part of the population is confined to dead-end, low-wage jobs — with frequent spells on the unemployment rolls.

This kind of educational foundation, complemented by well thought-out training programs oriented toward particular lines of work, is, however, a kind of 'public good.' This raises questions of who is to provide such an education and who is to pay for it. In Japan, the problem is solved by a rigid division between the publicly funded school system (educational foundations) and privately funded and provided training. Basic standards are secured by government certification of industry-based instructors, and firms do not fear 'poaching' because the industrial relations system promises 'lifetime employment,' at least for core workers. Such a system, however, goes against certain values as basic to Canadian society as they are to Western European societies:

> Unlike in Japanese firms, training investment in Western firms can never by safely internalized as the skills imparted on a worker cannot be appropriated by the employer....The "Western" view of the dignity of working people, and also the power of workers vis-a-vis their employers, depend to an important extent on this possibility.[63]

The right to choose among potential employers has long been regarded as a basic right in Canada as in Western Europe, and the results of Study Team 2's consultations indicate that both employers and unions continue to value individual freedom. Both thus favour public provision of generic skills while they disagree on funding: employers tend to favour public funding, whereas the unions tend to favour the grant/levy system.[64] In a period of budgetary restraint, some form of the latter seems sensible, especially if more funding is needed to integrate currently marginalized workers into the core labour force.[65]

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[62] J. Mathews, G. Hall, and H. Smith, "Towards Flexible Skill Formation and Technological Literacy: Challenges Facing the Education System," *Economic and Industrial Democracy*, 9:4, 1988.

[63] W. Streeck, op. cit., p. 93.

[64] See *Working Together To Manage Change*, op. cit. for a discussion of the grant/levy system. The De Grandpre report argued instead for some form of training tax which employers who were prepared to invest in training would get back.

[65] See critique of the CJS in the previous section. Study Team Four's report, *Pressures for Change, Opportunities for Development*, 1 May 1989, also notes that to provide the kind of post-secondary education advocated here, the CAATs will need additional financial support.

The second basic principle is **flexible learning**. The term 'flexible learning' tends to be associated with the application of new technology to training delivery (e.g. distance learning) or with the introduction of 'training modules.' Both developments can contribute to enhancing the flexibility of the training system, and enhanced flexibility is desirable if the current workforce is to become substantially involved in lifelong learning. In other words, the colleges will need to continue to experiment with new forms and methods of delivery if their programs are to meet the needs of those currently in the workforce.[66] Yet flexible learning should mean more than this:

> Flexible learning should be seen as an educational philosophy which advocates an open, flexible approach both to current developments and the delivery of programs; that is, an approach which recognizes the role of both teacher and student in deciding what and how to learn, and which also recognizes the potential of technology to enhance the productivity of teachers and the quality of learning. Such an approach is in marked contrast to a technology-driven approach to instruction, introduced within a Taylorist paradigm.[67]

In other words, flexible learning does not mean a fixation on form at the expense of content, or quantity at the expense of quality.

Several of those consulted by Study Team 2 have raised the issue of how to reconcile flexibility (and sensitivity to local needs) with quality control (and transferability) via the central imposition of standards.[68] The literature on the current wave of technological and organizational change is suggestive of new ways to secure coordination without recourse to bureaucratic centralization. This suggests the possibility of establishing a multipartite provincial body, with representatives from employers, unions, community groups, and the relevant ministries, complemented by local bodies with a similar composition. The provincial board could act as a coordinator and guarantor of basic standards and could develop the latter via a creative dialogue with the local boards. Such a structure would be aimed simultaneously at flexibility/responsiveness to local needs and quality/transferability.

If Vision 2000 set its sights on the development of a community college system oriented to imparting technological literacy and the provision of flexible learning, it can make an important contribution to the province's development. Such a 'pro-active' stance is not utopian. The wider debate on restructuring within Ontario and Canada as a whole constitutes a 'window of opportunity,' a chance to exercise real leadership in favour of equity and efficiency.

Conclusion

Restructuring is not a process dictated by market forces nor one governed by technological imperatives. It is a matter of intelligent planning to meet socially determined goals. Ontarians can choose to move in the direction of greater skill and income polarization via policies based either on a misreading of the potential inherent in the new technology (that is, the sunset/sunrise dichotomy) or policies which focus exclusively on the promotion of a shift to high value-added manufacturing while the service sector is reshaped by 'market' forces. Alternatively, Ontarians can choose to improve the terms of the equity-efficiency trade-off by adopting a complex of policies that aim simultaneously at industrial renewal (the shift to 'diversified quality production') and balanced development in the service sector.

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[66] Classes can be delivered in community centres, shopping malls, and union halls — sites where many adults are more likely to feel at home. As in Sweden, modules can be used to allow students to start at times other than the beginning of academic terms. Course content and style of delivery may need to be altered to build on the knowledge gained from experience that adult students bring to the classroom. The CAATs and universities should also work together to facilitate transfer of credits from one kind of institution to another — a flow which can go in either direction as university students can require applied courses that allow them to round out their skills.

[67] Mathews et al, op. cit., p. 517.

[68] This issue is discussed in some depth in **Pressures for Change**, op. cit. Three options are considered: local autonomy; regional colleges; and central coordination. While the report is helpful, the choices laid out fail to break sufficiently with the centralization/decentralization dichotomy that is becoming somewhat outdated.

In shaping the future, labour market policy has an important part to play. If the latter is designed to produce an elite core of highly qualified workers via universities and the CAATs, leaving to employers the task of providing narrow, on-the-job training (where and when required to operate new equipment or to acquire the 'right' attitudes), then polarization is the likely outcome. Conversely, if the emphasis is on a system that combines basic academic abilities and 'technological literacy'; the development of the kind of generic skills required to get the most out of flexible automation, and the para-professional qualifications required to revitalize the welfare state; and if the whole system is based on 'flexible learning' available to all — then both equity and efficiency will be enhanced.

Ontario's CAATs would have a role to play in either system. Under the first, they could supplement the universities by providing the technicians who will displace the skilled and semi-skilled workers that currently run the production process. They might also continue to provide 'remedial' skills for those destined to work in low-wage, dead-end jobs. They can make an even more significant contribution, however, if they develop their existing strength as providers of those crucial intermediate skills need for the second — and, from the standpoint of equity and efficiency, more desirable — option to work. If the latter is chosen, the CAATs can indeed become the 'centres of life-long learning, community development, and applied research' advocated by the Senate Sub-Committee.

Colleges
and the
Changing Economy

Background Papers

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New Technology and Education: A Challenge for the Colleges

Study Team 2

New Technology and Education:
A Challenge for the Colleges

Summary

The economies of the industrial countries are undergoing a period of profound economic adjustment. Patterns of industrial production, international economic relations, and the consensus over accepted approaches to economic policy are all in a state of flux. This period of economic change is also characterized by an anomalous combination of persistent unemployment and critical skill shortages in a range of occupations.

The present period of economic dislocation involves a process of invention and experimentation in the search for new technologies and new forms of production and distribution. Although technological innovation is a regular feature of industrial economies, the magnitude of the current dislocation results from the pervasiveness of the innovation under way. Shifts of this magnitude have occurred only three or four times previously in the history of the industrial economies.

Some observers have characterized the changes we are currently experiencing as a new technological revolution or the emergence of a new techno-economic paradigm. What distinguishes technological revolution from lower orders of technological change is the specific set of characteristics associated with its most important input, or key factor. The key factor is characterized by a low and rapidly falling relative cost curve; a virtually unlimited source of supply over long periods of time; and an obvious potential for its use or adoption as a factor in a wide range of products and processes throughout many branches of the economy. A recent investigation conducted for the OECD by a group of experts concluded that there is only one set of technologies today that meets these criteria for the key factor in a new technological revolution: microelectronic-based information technologies.

The emergence of a new techno-economic paradigm requires a corresponding shift in a range of other social and political institutions to facilitate the effective diffusion and adoption of the new technologies. Of critical significance for the present investigation is the availability of a labour force with the appropriate mix of skills and occupations. The implications of the new techno-economic paradigm may call for an adjustment of the skill profile at all levels of the workforce. On balance, the trends associated with the managerial common sense of the new paradigm are towards higher and broader levels of skill and for greater flexibility in the way that skills are deployed in the labour process. The overall emphasis is on flexibility in the use of new technology across all sectors of the economy. The need for greater flexibility arises from the quantum increase in the computer-mediated nature of work. The spread of information technologies requires individuals in a wide range of jobs to accomplish their work through the medium of an information system, rather than through direct contact with the object of the task.

The growing interposition of information systems between operators and their work process means that their relationship with that work process becomes far more abstract and formalized. Workers in such a cybernated system require skills which are defined as a general ability to understand how a system functions and to think flexibly in trying to solve problems.

The rapid pace of change associated with the new techno-economic paradigm make it unlikely that the skills acquired by students in their primary or secondary education will remain adequate throughout the entire course of their working careers. Workers must be prepared to adjust their skill levels and acquire related skills on an ongoing basis. Post-secondary institutions, particularly the college system, will face a challenge in deciding what kinds of training to provide for which categories of labour market entrants or members of the active workforce.

In light of the considerable uncertainty about future requirements for specific skills and the increasing importance of workplace centred learning, there is a growing consensus that the educational system should place greater emphasis on the transmission of fundamental skills. The concept of fundamental skills can be construed as having four dimensions:

- Analytical problem-solving skills;
- Functional literacy;
- Technological literacy; and
- Interpersonal and communications skills.

The challenge for the colleges is to structure these components of fundamental skills into every aspect of their curriculum programming. The range of fundamental skills required by the technologically literate workers of the new paradigm cannot be taught as a discrete component of an increasingly specialized curriculum. Rather, they involve fundamental and generic skills that should form the basis of every other aspect of the curriculum. The colleges will also need to customize their learning packages to meet the diverse needs of a wide range of client groups. In effect, they will need to adopt the same principles for the flexible provision of education that constitute the best practice frontier of management in the new techno-economic paradigm.

Les nouvelles technologies et l'éducation : un défi pour les collèges

Sommaire

Les économies des pays industrialisés connaissent présentement une période de profonds ajustements. Les mécanismes de production industrielle, les relations économiques internationales et le consensus au sujet des approches habituelles en matière de politiques économiques connaissent de fréquentes modifications. Cette période de changements économiques est aussi caractérisée par un chômage persistant et des pénuries de main-d'œuvre touchant une gamme étendue de métiers.

La période actuelle de dislocation économique donne également lieu à la mise au point et à l'expérimentation de nouvelles technologies et de nouvelles méthodes de production et de distribution. Même si les innovations technologiques sont une caractéristique courante des économies industrialisées, l'ampleur de la présente dislocation est attribuable à la multitude d'innovations technologiques que nous connaissons à l'heure actuelle. Des transformations aussi importantes ne sont survenues que trois ou quatre fois dans l'histoire des économies industrialisées.

Les changements dont nous sommes témoins ont été qualifiés par certains observateurs de révolution technologique ou de l'apparition d'un paradigme techno-économique. Ce qui distingue une révolution technologique des simples changements technologiques est l'ensemble des caractéristiques liées à l'intrant le plus important ou facteur-clé. Ce facteur-clé est caractérisé par une chute rapide des coûts relatifs, un approvisionnement pratiquement illimité pendant de longues périodes, de même que par un potentiel évident d'utilisation ou d'adoption comme facteur pour une grande variété de produits et de procédés dans plusieurs secteurs de l'économie. Une enquête effectuée récemment pour l'OCDE par un groupe d'experts a permis de conclure qu'il n'existe présentement qu'un seul ensemble de technologies répondant aux critères définissant le facteur-clé d'une nouvelle révolution technologique, à savoir, les technologies d'information fondées sur la micro-électronique.

Par ailleurs, l'apparition d'un nouveau paradigme techno-économique exige des changements correspondants aux institutions sociales et politiques pour faciliter la diffusion et l'adoption efficaces des nouvelles technologies. Un aspect essentiel de la présente étude est de considérer la disponibilité d'une main-d'œuvre compétente et de la variété requise de métiers. Les répercussions d'un nouveau paradigme techno-économique exigeront peut-être un ajustement de la gamme d'aptitudes requises par l'ensemble de la main-d'œuvre. En définitive, les tendances découlant de ce nouveau paradigme conduisent à une spécialisation accrue et plus étendue de la main-d'œuvre et à une plus grande souplesse dans la façon dont cette spécialisation est répartie au sein de la main-d'œuvre. Dans l'ensemble, l'accent est mis sur la souplesse requise pour assurer une plus grande utilisation des nouvelles technologies dans tous les secteurs de l'économie. Cette souplesse accrue est nécessaire en raison du degré très élevé d'informatisation du travail. La diffusion des technologies d'information exige que les personnes occupant une gamme étendue de métiers accomplissent leur travail à l'aide de systèmes informatiques, plutôt qu'en relation directe avec l'objet du travail.

L'interposition croissante des systèmes informatiques entre les utilisateurs et le processus du travail signifie que ce processus devient de plus en plus abstrait et routinier. Les travailleurs fonctionnant dans un tel système cybernétique doivent posséder des aptitudes générales leur permettant de comprendre comment fonctionne un système et de faire preuve de la souplesse intellectuelle nécessaire pour résoudre des problèmes.

Les changements rapides découlant du nouveau paradigme techno-économique signifient qu'il est de moins en moins probable que les aptitudes acquises pendant les études élémentaires et secondaires soient adéquates pendant toute la durée de la carrière d'une personne. Les travailleurs doivent être disposés à améliorer régulièrement leurs aptitudes et à acquérir des aptitudes connexes. Les établissements d'enseignement postsecondaire, et plus particulièrement le réseau collégial, feront face à un défi lorsqu'ils décideront de la nature de la formation à offrir et des catégories de futurs travailleurs ou de personnes faisant partie de la main-d'œuvre à qui cette formation sera destinée.

En raison du degré élevé d'incertitude au sujet des futures exigences relatives aux aptitudes particulières et de l'importance croissante de l'apprentissage en milieu de travail, on reconnaît de plus en plus que le système d'éducation devra mettre un accent accru sur l'apprentissage des aptitudes fondamentales. Cette notion d'aptitudes fondamentales peut être définie par les quatre éléments suivants :

- des aptitudes analytiques permettant de résoudre les problèmes;
- une alphabétisation fonctionnelle;
- des aptitudes technologiques;
- des aptitudes de communication et de relations interpersonnelles.

Le défi que les collèges devront relever est de structurer ces aptitudes fondamentales dans tous les aspects de leurs programmes d'études. La gamme d'aptitudes fondamentales requises par les travailleurs devant fonctionner dans le milieu technologique créé par le nouveau paradigme ne peut être enseignée au moyen d'éléments peu importants au sein de programmes d'études de plus en plus spécialisés. L'enseignement des aptitudes fondamentales et générales devrait plutôt être le fondement de tous les aspects des programmes d'études. Les collèges devront également adapter leurs méthodes d'apprentissage pour répondre aux différents besoins d'une clientèle diversifiée. En fait, ils devront offrir des services d'éducation suffisamment souples et reposant sur les mêmes principes de gestion qui s'imposent dans le nouveau paradigme techno-économique.

Table of Contents

		Page
1.	Introduction	1
2.	The Emergence of a New Techno-Economic Paradigm	2
3.	The Emerging Information Technology Paradigm	5
4.	The Skill Requirements of the New Techno-Economic Paradigm	7
5.	New Skill Requirements and the Educational System	11
6.	Education, Skills, and International Competitiveness	16
7.	References	17

1 Introduction

The Canadian economy is currently characterized by a curious paradox. After five years of sustained growth since the severe recession of the early 1980s, unemployment remains at relatively high levels, even in Ontario. Coincident with high unemployment, however, there is strong evidence of serious labour shortages in a wide range of skills. Both journalistic and more statistical accounts indicate that employers are experiencing difficulty in recruiting labour for needed jobs. The existing mismatch between labour supply and demand is paralleled by evidence of a great deal of churn in labour markets. This mismatch is indicative of a period of substantial economic adjustment. Although it is still too early to assess the ultimate impact of the bilateral trade deal with the US, it will likely contribute to further restructuring in the domestic economy.

These economic challenges are common to many of the industrial democracies. Collectively, they are experiencing their most significant adjustment since the depression of the 1930s. Patterns of industrial production, international economic relations, and the consensus over accepted approaches to economic policy are all in a state of flux. Accepted standards of managerial best practice and the state of the art in technology are also changing at a rapid pace.

> Once every century or so, the way of making things changes with a sweeping flourish. Right now, the workshops of the industrial world are on the cusp of their next major reformation. The "factory of the future" that this entails — automated and sophisticated, yet flexible enough virtually to allow each customer to design his own product — has long been predicted, described and analysed. Now, faster than anyone expected, the future is actually arriving. It will change what companies make, the ways they organize themselves and how they compete (The Economist, 1989: 13).

The task for Vision 2000 consists, in part, of redefining the role of Ontario's college system in light of this transition. The changes under way pose a challenge to accepted notions of learning and working in every aspect of economic activity. It is imperative for the educational system to provide Canadian workers (both new entrants and those currently employed) with the skills to meet the competitive challenges of the 1990s and beyond. It is not clear that it is currently doing so. Several recent surveys indicate that skill shortages constitute a major impediment to increased output and improved productivity. In a recent survey by Statistics Canada, 14% of employers responded that their production was being impeded by a lack of skilled labour. Surveys by employers' organizations recorded similar problems. The Canadian Federation of Independent Business reported that the proportion of its members citing a shortage of qualified labour as a problem rose from 30% in 1985 to 50% in late 1988. Finally, 36% of manufacturing firms surveyed by the Canadian Manufacturers' Association in early 1988 complained of difficulties in finding skilled tradespeople. These findings were further confirmed in the consultation process conducted for Study Team 2. Employers stated emphatically that the workforce in Canada is not well enough educated, and that they faced serious shortages of skilled workers (Employment and Immigration Canada, 1989: 24; cf. also Canadian Labour Market and Productivity Center, 1988: 20-22; Gill, 1989: 2).

The problem extends beyond serious shortages of qualified and skilled labour to fill job vacancies. Many members of the labour force who are currently employed lack the requisite skills to adequately perform their jobs. Several employers interviewed for a recent business magazine article complained that much of their workforce lacks the appropriate literacy skills to write adequate proposals, read complex manuals, or learn sophisticated new production techniques, such as statistical process control (Maynard, 1989: 88-90). The cumulative picture emerging from these statistical and anecdotal accounts suggests that a significant proportion of the Canadian workforce lacks the background of fundamental skills in literacy, numeracy, or analytical problem-solving required by the emerging information intensive economy.

If the problems that exist today are considered serious, the situation in the 1990s and beyond will compound them. Existing skill shortages will be exacerbated as the number of new labour market entrants declines precipitously. Conditioned by the increase in participation rates and the high unemployment of the 1970s, we have come to take the rapid growth of the labour force for granted. The situation in Ontario will be altered dramatically in the coming decade. A look at the changing demographic trends in the province suggests the cause. The average annual rate of increase in the labour supply declined from 3.6% in the decade between 1966-75 to a rate of 2.3% in the years between 1975-87. This trend will accelerate over the next decade. The annual increase in labour supply is expected to average only 1.3% from 1986-96 (Ministry of Skills Development, 1988: 28-30). As a consequence, employers will need to look to the currently employed labour force as the primary source of their future skill base.

The educational system in the coming decades will thus be faced with two simultaneous challenges: to ensure that new labour force entrants are provided with the fundamental skills they require to participate in the emerging economy; and to provide a wide array of learning opportunities and venues for current members of the labour force in need of both fundamental and applied skill upgrading. The demands placed upon the college system will be particularly acute. The overall skill levels required throughout many sectors of the economy are increasing. Although, the primary age cohort of college attendees will decline, the demand for higher qualifications will likely lead to higher participation rates. In addition, the large numbers of adult workers in search of skill upgrading will likely turn to the colleges as an important source of that upgrading. A focus on the year 2000 suggests that the colleges look beyond the current situation to anticipate how the emerging economic order will increase the demand for fundamental and applied skills through every branch and sector of the economy.

2 The Emergence of a New Techno-Economic Paradigm

Since the mid-1970s, the economies of all the industrialized countries have undergone a period of profound economic dislocation. Initially, this dislocation was experienced as a series of exogenous shocks to the system, in the form of energy and other critical shortages; and as endogenous policy failures, in the form of spiralling inflation rates and widening budgetary deficits. In the latter half of the decade and the early 1980s, the range of problems expanded to include stagflation, simultaneously rising unemployment and inflation; a shifting geographical distribution of production, marked by the rise of the newly industrializing countries (NICs); and a wave of technological change that threatened to displace whole industries or sectors of the economy.

The early manifestations of these economic changes led most commentators to attribute the problems of the 1970s to sources external to the industrial economies themselves — the machinations of foreign oil cartels or the policy failures of shortsighted political leaders. While these views continue to predominate in some circles, the extent of the recent changes have led others to characterize the current dislocation as constituting a structural break with the predominate technologies and organizing principles that have prevailed since World War II. The virtuous cycle of economic growth that was sustained from 1945 to the mid-70s resulted from the confluence of technological innovations; changes in forms of economic organization and industrial relations; a supporting infrastructure of social institutions, including an expanded educational system; and a new political framework for economic policy at both the national and international levels (Freeman, 1984a: 109-11).

The dynamism of the postwar expansion was fueled in large measure by the steady diffusion throughout the economy of a stock of scientific and technological innovations that had built up during the years of the Depression and World War II. The huge stock of scientific knowledge was accessible at relatively low cost and could readily be converted to civilian uses. Among the core technologies underlying the postwar expansion were low-cost oil, petrochemicals, and synthetic materials, which, together with consumer durables and vehicles, powered an energy intensive, mass production paradigm of economic growth. The predominance of these core technologies was complemented by the system of standardized mass production prevalent throughout the secondary manufacturing sector of the economy. The system was based upon continuous flow or assembly-line processes that specialized in producing large volumes of standardized commodities. The competitive advantages of this production system originated in the significant economies of scale that could be realized through high volume production for a largely homogeneous consumer market (Perez, 1986: 10-11).

Typically, standardized mass production was organized in large multi-divisional firms, governed by a managerial hierarchy that endorsed the principles of scientific management. This innovative system of standardized mass production was sustained by a set of changes in the supporting infrastructure of social and political institutions introduced in the postwar period. Among the more significant of these changes were the rapid expansion of the educational system to supply the highly qualified personnel required by the new production system; the policies of Keynesian demand management and the welfare state, which placed a floor under the consumption levels of the mass of income earners and helped absorb the higher levels of output from production; the institutionalization of industrial relations systems to regulate wage relations within the firm; and a new regime for international trade and finance that facilitated the global expansion of the industrial economies (Reich, 1984: ch. 4; Perez, 1983: 367-71).

The problems experienced after the mid-1970s resulted from a structural impasse among the various elements that had sustained the virtuous cycle of growth. As the industries based upon the core technologies matured over the postwar period, there was an increasing tendency for firms to "compete away" the profits generated by the technological innovations. The competition in these maturing industries was intensified by the global expansion of the capitalist economies and the resulting increase in international competition. Finally, the enhanced bargaining position enjoyed by wage labour under the conditions of sustained economic growth increased the incentives for firms to shift their capital investments towards cost saving innovations in process technologies. It was these internal dynamics of the postwar economy, rather than the exogenous shocks, that contributed to falling profit levels, slower productivity growth, and rising rates of unemployment (Freeman, Clark and Soete, 1982: 21, 75-80; Freeman, 1984b).

The impasse created by these changes constitute more than a temporary or cyclical disturbance to the industrial economies. The present period of dislocation involves a profound process of invention and experimentation in the search for new technologies and new forms of production and distribution. Although technological innovation is a regular feature of industrial economies, the magnitude of the current dislocation results from the pervasiveness of the innovation under way. Shifts of this magnitude have occurred only three or four times previously in the history of the industrial economies. In each instance, the diffusion of the new technologies and the process of economic change persisted over several decades. In the course of the transition, virtually no sector of the economy, nor aspect of economic activity, was left untouched. And the social and political consequences of the changes were profoundly disruptive for the members of the societies who lived through them (OECD, 1988: 11).

While it has become a journalistic commonplace to describe the current era as one of unprecedented technological change, this masks the distinctive character of the changes that are occurring. Students of technology have come to distinguish between four levels of technological innovation. These can be described as incremental innovations, radical innovations, new technology systems, and new technological revolutions or techno-economic paradigms.

Incremental innovations occur as a regular part of economic activity throughout the various branches of industry. This type of change frequently occurs in the process of "learning by doing" or "learning by using" rather than as a result of a consciously directed research and development effort in the firm. Radical innovations represent irregular occurrences in the process of innovation and emerge from the development of unique products and processes. They are increasingly the outcome of consciously directed research and development efforts in university or government laboratories and in the firm. The third level of innovation refers to the emergence of "new technology systems," which are "constellations" of innovations, systematically linked to each other in both technological and economic terms (Keirstead, 1984). Examples of these types of interrelated innovations include clusters of synthetic materials or petrochemicals developed in the 1930s, 1940s, and 1950s. As a constellation of radical innovations develops in tandem, simultaneously displacing existing branches of the economy and creating new ones, it can generate major problems of structural adjustment (Freeman, 1987a: 129-30; OECD, 1988: 34-35).

The fourth order of change is described as a new technological revolution or the emergence of a new techno-economic paradigm. The distinction between the third and fourth order of change involves the extent of the effects exerted throughout the economy as a whole. Some "technology systems" are so far reaching in their effects that they can potentially alter the conditions of production and distribution in every branch and sector of the economy. Technological revolutions carry with them a host of incremental and radical innovations and may potentially include several new technology systems as well. They alter not only the competitive structure of specific branches or sectors of the economy, but the entire input cost structure and conditions of production and distribution throughout the economy. Changes of this magnitude exert the most disruptive effect on industrial economies (Freeman, 1987a: 130; OECD, 1988: 35).

What distinguishes a technological revolution from the lower orders of technological change is the specific set of characteristics associated with its most important input, or key factor. The key factor underlying each paradigm is characterized by a low and rapidly falling relative cost curve; a virtually unlimited source of supply over long periods of time; and an obvious potential for its use or adoption as a factor in a wide range of products and processes throughout many branches of the economy (Freeman and Perez, 1988: 48).

The emergence of a new techno-economic paradigm involves a number of related developments at both the techno-economic and socio-political levels of society. The new key factor evolves at the core of a rapidly growing system of technical, social, and managerial innovations, some related to the production of the key factor itself and others to its utilization. The diffusion of the core technology tends to alter requirements for labour input into the production of different goods and services, as well as the skill profile of the jobs associated with production. Finally, it can restructure the relationship between existing branches of industries or individual nations within the global economy. Those national economies which exploit the potential of the new technologies most effectively may enjoy a dramatic improvement in their comparative advantage (Perez, 1985: 444; Perez and Freeman, 1988: 59).

In addition, the new constellation of technologies cannot be generalized throughout the economy without a corresponding shift in a range of other social and political institutions to accommodate it. The relevant range of socio-political institutions can include the legal and institutional mechanisms for regulating various markets, such as labour and capital; the regulation of the financial system at the national and international levels; the overall role of the public sector in generating and redistributing income; links between the educational and training system and the productive process; the form of organization of workers, as well as the industrial relations system which regulates the conditions under which it operates; and finally, the international trading and financial regime (Perez, 1983: 357-75; 1985; 445-46).[1]

From this perspective, the resumption of a new, long period of growth requires the renovation of a wide range of institutions that can contribute to the rapid adoption and diffusion of the new technologies. Of particular relevance to the present discussion is the role of the educational and training system in facilitating this transition. Growing evidence indicates that the pace of diffusion of new technologies will be critically affected by the availability of a labour force with the appropriate mix of occupations and skills. However, the choices made in the design and implementation of the education and training system for the future may significantly affect the quality of life that we enjoy. As the experience of the postwar decades suggests, the socio-political infrastructure appropriate to each techno-economic paradigm can accommodate a wide range of national variations. The implication of this for the current situation, as Mahon argues in her paper, is that the process of economic and industrial restructuring is not dictated by market forces, nor governed by technological imperatives; rather, it is a matter of political choice. The decisions made with respect to the future role of the education and training system represent a fundamental element of this choice (1989: 25).

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[1] For a more extensive discussion of the relation between techno-economic systems of production and infrastructures of social and political institutions, as well as the conditions which promote or impede a balance between them, cf. Wolfe (1988).

3 The Emerging Information Technology Paradigm

Observers have suggested that there exist several new technologies with the potential to constitute the basis of a new technological revolution. In a recent report to the OECD, a group of experts rated the potential of each of these new technologies. They felt that only one displayed the essential characteristics associated with the key factor of a new techno-economic paradigm. Only information technology (IT) has the capacity to truly revolutionize the conditions of production throughout virtually every branch of the extractive, goods producing, and service sectors of the economy. Moreover, the new information technologies have been most remarkable for the dramatic rate of reduction in the cost, and rapid increase in the supply, of their key factor, microelectronic components (OECD, 1988: 35-37).

The reduction in the size and cost of microelectronic components and the increase in the information processing content of work fundamentally alters the economics of production. Most significantly, the application of IT to goods and service production allows greater flexibility in the design of custom products and greater speed in the implementation of design changes. This emphasis on flexibility of production directly contravenes the logic of the prevailing technological paradigm — standardized mass production. The strength of the prevailing paradigm was based on the realization of significant scale economies in production — the use of dedicated equipment to produce a high volume of standardized commodities. The economic calculus of the new paradigm is based on the ability to realize economies of scope. The programmable nature of new technology facilitates the rapid adjustment of production technology, making small production runs for custom designed products economical. Firms employing this new logic gain the ability to produce a flexible and rapidly changing mix of products and services. The new productive organization employing economies of scope is termed "flexible specialization" or "diversified quality production" (Piore and Sabel, 1984: 258-63; Freeman, 1987a: 132; Sorge and Streeck, 1988: 30-31; OECD, 1988 39-40).[2]

A major source of dynamism for the new paradigm is the growing convergence of microelectronic-based computers and telecommunications technologies and many applications of these core technologies which deal with information in digital form. The new IT paradigm tends to increase the information content of both goods and service products, due to the capacity of microelectronics to reduce the cost of information handling and transmission (Perez, 1986: 17). The dynamic potential of the new paradigm is enhanced by its ease of application to all information handling activities throughout the economy. The growing relevance of IT flows from the fact that the information processing content of all work activity, regardless of sector, is increasing (Miles, 1988: 7-9).

The convergence of computers and telecommunications makes it possible to use electronic networks to integrate a range of diverse activities within firms or between firms across large geographic spaces. The development of more effective communications networks promotes significant savings in inventory and the more rapid response to changes in levels of demand for specific products. Just as the integration of IT in production equipment allows for more flexible production of custom goods on the supply side, the integration of suppliers, assemblers and retailers through electronic networks facilitates a more flexible response to market conditions on the demand side. The use of just-in-time systems to achieve greater coordination between suppliers and assemblers in the auto industry and the electronic linking of retail outlets and small craft producers in the fashion industry represent important examples of this trend. Ultimately, IT promotes the greater integration of design, engineering, manufacturing, sales, and administration, leading to the development of concepts such as computer-integrated manufacturing (CIM). The creation of electronic networks to facilitate the transmission of data in the financial services industry represents an important application in the service sector (Miles et al., 1988 82-86; OECD, 1988: 39).

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[2] The exaggerated claims made on behalf of flexible specialization have been subjected to increasing scrutiny. For a sober examination of its limitations, cf. Gertler, 1988. The major limitations encountered to date in the implementation of this new production system appear to be social and organizational, rather than technological. This finding underlines the significance of Perez' argument about the need for institutional adaptation as an integral component of the new techno-economic paradigm.

Although the characteristics ascribed to flexible production have been associated mainly with manufacturing industries, the pattern may be replicated in a broad range of service industries as well. The adoption of information technology to service activities has been associated with three types of changes. The use of information technology allows the locus of delivery of the service to relocate from the point of production to the point at which it is consumed. Information technology also makes it possible to fashion the provision of many services to the requirements of individual clients. Thus, the nature of the service product changes from a standardized one that is mass produced and consumed to a more customized one tailored to meet the information requirements of individual clients. Finally, the application of information technology in the service sector modifies the nature of the producer-consumer relationship in a more interactive direction. It thus promotes a convergence with the pattern emerging in the transformative sector of the economy (Barras, 1986: 168; Miles, 1987a: 40-49).

The rapid penetration of new information technology into both manufacturing and service industries signals a growing convergence between these traditionally distinct industrial sectors. The technologically sophisticated products of the secondary manufacturing sector provide necessary inputs for a range of information and telecommunications activities in the service sector. Conversely, the information intensive outputs of the tertiary sector provide vital inputs into an increasing range of manufacturing activities. At the same time, the nature of the work process, the levels of capital intensity, the organizational structures of firms and the skill profile of the labour force in the two sectors are coming to resemble each other. The growing convergence of manufacturing and services also signals that it will be less possible to specialize in the products of one sector or the other for purposes of international trade; both will be essential for competitive success (Miles, 1987b; Cohen and Zysman, 1987: 38-41).

The conjunction of characteristics associated with the emerging IT paradigm is progressively altering the prevailing conception of engineering and managerial common sense. In the process, a new concept of managerial best practice is taking shape through a process of "learning by using" or "learning by doing". The new conception of management and work organization stands much of the accepted one on its head. The fundamental principles of hierarchy and managerial control at the heart of the theory of scientific management are being questioned. Management theorists stress the value of commitment on the part of the workforce over traditional forms of control (Walton, 1985). Along with the emphasis on commitment, increased autonomy in the work process is valued more than a highly centralized management structure. Flexibility and adaptability are the underpinnings of the new best practice frontier rather than sheer size and scale (Perez, 1986: 7-12; OECD, 1988: 67-75).

The recently released MIT Commission on Industrial Productivity drew attention to six characteristics of the developing best practice frontier: "1) a focus on simultaneous improvement in cost, quality and delivery; 2) closer links with customers; 3) closer relationships with suppliers; 4) the effective use of technology for strategic advantage; 5) less hierarchical and less compartmentalized organizations for greater flexibility; and 6) human resource policies that promote continuous learning, teamwork, participation and flexibility" (Dertouzos et al., 1989: 118; cf. also Hayes and Jaikumar, 1988). These changes in managerial best practice imply the need for changes in the type and variety of skills appropriate to a workforce in this organizational setting.

4 The Skill Requirements of the New Techno-Economic Paradigm

The exact skill effects of technological change have been the subject of much debate. A number of studies have approached the question from radically different perspectives. The debate has focused around three distinct views: an upgrading or upskilling view, a downgrading or deskilling view, and a conditional perspective. The upgrading view, grounded in the premises of neoclassical economics, maintains that economic development involves a process of increased differentiation and efficiency. This process of change invariably requires a broader variety of skills and a higher average level of skills from the labour force. Conversely, the downgrading view draws upon studies of the labour process to argue that capitalist industrialization has involved the steady fragmentation and narrowing of tasks and a separation of the planning and conceptual aspects of work from the execution. Finally, the conditional perspective maintains that the results tend to be more mixed and offsetting, depending on the level of automation in production, the organizational context within which innovation occurs, or the choices effected by management in the process of change (Spenner, 1988: 132-34).

A certain amount of confusion has been generated in this debate by the tendency to collapse different levels of analysis. Skill changes in various branches or sectors of the economy can occur as a result of two distinctly different processes. Skill changes can come about through changes in industrial composition, that is the creation or destruction of certain types of jobs in specific industries or branches of the economy. The second way in which skill changes can occur is through actual changes in the content of specific jobs. Debate over the likely skill effects of technological change can be confused by a tendency to collapse the two categories of analysis into one.

Empirical studies, at both the aggregate and case study levels, have found that there are two basic dimensions which differentiate changes in skill levels: substantive complexity and autonomy-control. The first dimension refers to "the level, scope and integration of mental, manipulative and interpersonal tasks in a job." The level, scope and integration of tasks define an important range of variation in skill requirements. The substantive complexity of tasks can also vary considerably depending on the subdimensions of cognitive, motor, physical, or other demands required by the job. Tasks involving the integration of a range of cognitive or physical demands across a wide scope of settings, but at a fairly low level on each subdimension, may require greater skill than those involving higher levels across a narrow range of settings and with little or no integration. The subdimensions of mental, manipulative, and interpersonal may be assuming greater significance in light of the current shift in techno-economic paradigm. Information technology may demand higher levels of mental and interpersonal task performance in comparison with the emphasis placed on manipulative tasks by the prevailing paradigm of standardized mass production (Spenner, 1988: 140).

The second important dimension, autonomy-control, "refers to the discretion available in a job to initiate and conclude action, to control the content, manner, and speed with which a task is done" (Spenner, 1988: 141). As was noted above, organizational changes accompanying the introduction of new information technologies appear to place a premium on the increase of autonomy in the performance of work tasks at the expense of existing degrees of managerial control. Those companies operating at the new best practice frontier emphasize flatter, more horizontal relationships throughout the company and allow for greater experimentation and innovation on the shop floor as well as in the lab (Hayes and Jaikumar, 1988: 82). As this shift along the autonomy-control dimension spreads more widely, it may result in a significant change in skill requirements.

A major survey of the cumulative evidence from studies on skill changes was recently commissioned by the Panel on Technology and Employment of the US Academy of Sciences, Academy of Engineering, and Institute of Medicine. The survey concluded that most studies carried out tend to emphasize the dimension of substantive complexity at the expense of the autonomy-control dimension. The cumulative results of the aggregate studies of the skill effects of technological change suggest that, over the course of the postwar period, there is little evidence in support of dramatic shifts in skill levels arising from changes in the substantive complexity of job content. The bulk of the evidence concludes that there is little net change or a small degree of upgrading. Studies of changes in substantive complexity arising from shifts in the industrial and occupational composition of the labour force indicate a small degree of upgrading has occurred over the postwar period. The studies of shifts in skill along the autonomy-control dimension produce inconclusive or contradictory results. The author of the survey concludes that the predominant result of these studies is uncertainty (Spenner, 1988: 146-47).

In contrast, the results from the case studies surveyed indicate a more variable outcome. The case studies tend to pay more attention to the autonomy-control dimension than do the aggregate studies. They provide stronger evidence in support of the downgrading hypothesis but they also indicate that variations in geographical and organizational context can exert a determining influence over the exact outcome. In particular, some of the case studies place overwhelming emphasis on the variable influence that management strategies exert in this regard. On balance, the author concludes that the cumulative effect of both the aggregate and case studies tends to reinforce the finding of uncertainty (Spenner, 1988: 148-59).

The evidence available from Canadian studies at the aggregate level tends to produce comparable results to those in the US survey. The recent study conducted by the Economic Council of Canada (ECC) did not explicitly study the skill effects of technological change, but did examine the shifting occupational composition of employment between 1971 and 1981. The study used the income and educational levels associated with the fastest growing and fastest declining occupations as a proxy for the relative skill changes. Overall, they found that of the thirty fastest growing occupations, fourteen had above average relative incomes, nine had average incomes, and seven were below average. The distribution by educational level corresponded very closely. Similarly, in the case of the thirty fastest declining occupations, more than half registered below average on both the relative income and educational scales. They concluded that "the very most that could be claimed is some tendency towards overall upgrading of the job structure", although the evidence does not demonstrate what proportion is directly attributable to technological change (Newton and Leckie, 1987: 118-19; Economic Council of Canada, 1987: 17-19).

Another Canadian study based upon Statistics Canada data produced broadly comparable results. Following the distinction suggested by Spenner, John Myles examined the evidence in support of skill changes arising from compositional shifts in the distribution of occupations and changes in the work content of occupations between 1961 and 1981. Myles found some evidence of skill upgrading in the decade of the 1960s, arising mostly from changes in industrial composition. However, most of the change in skill levels occurred in the decade of the 1970s and was attributable to the changing skill mix within industry (Myles, 1988: 343-50).

A recent survey of the available case study evidence on the skill effects of technological change in Canada also noted mixed results. The impact of technology on skills is ambiguous; it is often less determinant of skill than other factors, such as the way work is organized and jobs are designed. While there is a general trend towards an upward shift in skill requirements, there are specific situations where work has been deskilled. Manual and clerical jobs are the mostly easily automated, and their elimination results in an increase in general skill levels. In addition, computerization increases the skill requirements of many individual jobs, although some traditional craft skills are vulnerable to being made redundant. The survey noted that in some cases where more advanced forms of computerization had been introduced, there was evidence of a demand for more analytical, problem solving skills and an increase in operator autonomy (Salter et al., 1988: ch. 5).

The cumulative results of the surveys to date, from both foreign and Canadian sources, indicates there has been a modest upgrading of skill, on balance, over recent decades. There is reason, however, to be skeptical about how reliable a guide past experience will prove with respect to future developments. While past trends may be replicated under conditions of a stable techno-economic paradigm and a prevailing managerial common sense, this is less likely to hold in a period of paradigm shift. The very nature of the emerging paradigm implies a radical disjuncture with past ways of organizing work and past requirements for skill levels. The process of a paradigm shift, by its very nature, creates the demand for a new and unprecedented set of skills while it renders many existing ones obsolete.

The persistence of critical skill shortages in a period of relatively high unemployment, noted at the outset, is consistent with this hypothesis. Patterns observed in several European countries support the evidence cited for Canada. The areas most directly affected include the range of electrical engineering skills related to the new information technologies. The importance of these skill shortages extends far beyond that represented by the simple number of job vacancies. Frequently, these shortages exist at the technological frontier of the emerging paradigm. They may constitute a critical bottleneck inhibiting the pace of diffusion of the new technologies. Shortages of the required skills may prevent companies from successfully carrying out the design and redesign of products incorporating the most advanced features of the new technology (Freeman, 1987a: 148). It is not surprising to find the executives of Canada's leading information technology firms, such as Northern Telecom, in the vanguard of those calling for increased investment in Canada's educational system. Similarly, the recent human resources strategy prepared for the Canadian Electrical and Electronics Manufacturing Industry expressed grave concern over the shrinking pool of post-secondary school graduates with qualifications in electrical and electronics technology or general engineering (Joint Human Resources Committee, 1988: 27).

The skill implications of the new techno-economic paradigm extend far beyond those high level skills at the bottle-neck. The need for an adjustment of the skill profile extends to all levels of the workforce. Recent evidence on the employment and skill effects of technological change has noted significant differences between earlier generations of industrial technology and the current wave of programmable technology that incorporates microelectronic components. The substantive difference between the skill effects of the two forms of technology arises from the flexibility inherent in programmable technology. A growing body of findings notes that the skill and organizational coordinates of microelectronic technology are indeterminate because the inherent flexibility of the technology allows for a wide range of outcomes. For instance, there is a world of difference between the previous generation of numerical control (NC) machinery and computerized numerical control (CNC):

> CNC differs from NC in that it is more flexible and offers the worker the ability to interrupt the automatic working of the machine and to reprogram on the shop-floor. No longer, as in the case of the NC system, does the technology dictate that programming be done in the office. This flexibility offers the choice of who should control the operation of the machine, and where, and by so doing, affects both the quality of the work and the type of skills required (Kaplinsky, 1987: 124; cf. also Senker, 1986: 107).

The programmable quality of microelectronic technology does not lead a priori to the upgrading or downgrading of skill levels. Its more malleable quality molds itself differently for different organizations and societies. A number of studies conducted at the firm level conclude that the same technology may have very different effects on the nature of work and skill levels in different firms, sectors, and countries. In this respect, the autonomy-control dimension of skill appears to be critical. One study of the impact of CNC in British and German industry noted significant differences between the two nations. In Britain, CNC was used in such a way as to maintain planning department control and/or autonomy, whereas in Germany, the organization linked foreman, chargehands, workers, and planners around a common concern. These distinctions originated with the approach to training. In Britain, there was a split at the beginning of working life between training for programming and planning occupations as opposed to the machining ones; conversely, in Germany, training in the latter set of skills was considered to be essential for training in the former. These management differences in organizational structure and training programs had lasting consequences for the personnel structures of the plant (Hartmann et al., 1983: 221-231).

David Noble's study of the introduction of NC and CNC equipment in the US noted a pattern similar to that of the UK. He observed that in many US plants managers were afraid of losing shop floor control and did not take full advantage of the more flexible programming capabilities of CNC. These choices inevitably led to decreased, or lower quality, production (Noble, 1978: 338-46). In a similar vein, studies by

Harley Shaiken and his collaborators for the US Office of Technology Assessment noticed a strikingly consistent pattern. They concluded that US corporations seek to use technology and shop-floor reorganization to remove constraints on managerial authority placed by workers' own skills and strong, independent unions. Because of this approach, management often pursues strategies that fail to take advantage of the complementary nature of programmable technology and skilled shop-floor workers. Instead, new, computerized technology is applied in ways that centralize control of production and attempt to reduce the unpredictability associated with worker autonomy (Shaiken et al., 1986: 167-183).

The results observed in the above studies reflect a broader range of differences in the approaches adopted in the US and UK, on the one hand, and Japan, on the other. A recent study compared the use of new flexible automation equipment in 35 manufacturing systems (FMS) in the United States with their use in 60 systems in Japan. The kinds of equipment being used and the products being made were comparable in every respect. The average number of parts made by a FMS in the US was 10, while, in Japan, it was 93. The study concluded that US manufacturers often fail to fully exploit flexible manufacturing systems that are capable of handling a wide variety of parts and tasks with little human intervention. Manufacturers usually program them to produce large volumes of standardized products in exactly the same fashion that they use conventional equipment. The US companies were using FMS according to the managerial common sense of the old paradigm, rather than the new, that is, for high volume production of a few parts, rather than for high variety production of many parts at low cost per unit (Jaikumar, 1986: 69-76).

The Japanese proficiency at exploiting the full potential of microelectronic technology is confirmed in another recent study for the International Labour Office. It documents that the introduction of computerized technology tends to upgrade job content and create the demand for workers who are multi-skilled. Many of the jobs involving new technology are creating a demand for qualifications that include both specialized technical knowledge and traditional craft skills (Mine, 1986: 491).

Although the available evidence on the skill effects of microelectronic technology is drawn largely from case studies, and the results are mixed, some patterns have begun to emerge. In the first instance, the autonomy-control dimension seems to assume considerable importance in determining the overall impact on skill levels. At the risk of some simplification, two polarized tendencies, closely related to the broader organizational aspects of the old and new techno-economic paradigms, have emerged. In large measure, the differences result from the extent to which management clings to the common sense of the old paradigm or the extent to which it has embraced the concepts of best practice associated with the new. At the same time, rigidities in the approach adopted by management to skill changes along the autonomy-control dimension may prove a serious impediment to the effective utilization of microelectronic technology (OECD, 1988: 69-73).

Studies by Peter Senker and a number of others have shown that although management in the UK, Canada, and the US may be reluctant to adopt the organizational and skill changes needed to maximize the opportunities afforded by the new technology, "This is no inexorable law of capitalism." Several highly successful capitalist countries, including Japan, Sweden, and West Germany, have adopted the changes that make more effective use of microelectronic technology.

> In some countries, notably, the USA and the UK, there is good evidence that, for many firms, deskilling the workforce is seen as a desirable goal in itself. In other countries, including West Germany, Japan and Norway, managements are far less inclined to take advantage of new technology to reduce workforce skills. . . . The evidence so far indicates that, if firms are to succeed in running more automated factories profitably, they will need to encourage their workforces to retain and expand their knowledge (Senker, 1986: 114-15).

Although the autonomy-control dimension appears to be paramount in determining the skill effects of microelectronic technology, there is also evidence of a significant shift in the substantive complexity dimension. Programmable automation necessitates a shift in emphasis from physical to mental demands. Skills such as manual loading, adjusting, and unloading machines, where few processes are automated, are being replaced by skills that require controlling, monitoring, and maintaining. Due to the variable nature of the skill effects of new technology, it is increasingly difficult to forecast which set of specific skills will be needed in the future. Further, technology and its use are changing so rapidly that many observers argue that specific skills are less important than the ability to study, think independently, learn quickly, be flexible, and work with others. Workers can no longer function with the knowledge of one single skill or how to run one machine. They must know how to integrate data, troubleshoot problems, and understand the relationship between increasingly complicated and expensive equipment.

Although many of the examples mentioned above refer to the skill effects of microelectronic technology in the manufacturing sector, the observations apply in the service sector as well. The changes occurring in skill levels mirror those in the transformative sector. Many routine information handling and clerical tasks in the office are being eliminated by the dissemination of information technology. However, these routine activities are being replaced by a need for higher level skills and greater flexibility in the use of IT. For instance, basic typing skills were initially replaced by the need for word processing skills and, more recently, desktop publishing skills. While many of the fundamental tasks in the service sector may be automated, this process generates the need for more advanced skills to assist in analysing and applying the information generated, processed, and stored by the new technology. The new information technologies will place a premium on skills that involve creativity, the ability to view one's task in the overall context of the organization's activities, the ability to express oneself, and the ability to take decisions (Dirrheimer, 1982: 35-42).

On balance, the trends associated with the managerial common sense of the new paradigm are towards higher and broader levels of skill and for greater flexibility in the way that skills are deployed in the labour process. The overall emphasis is on flexibility in the use of new technology across all sectors of the economy. The need for greater flexibility arises from the quantum increase in what has been labelled the computer-mediated nature of work. The spreading impact of information technology on a wide variety of tasks requires individuals to accomplish their work through the medium of an information system, rather than through direct contact with the object of the task (Zuboff, 1982).

The growing interposition of information systems between operators and their work process means that their relationship with that work process becomes far more abstract and formalized. The cognitive demands of an on-line, interactive work process, both in the manufacturing and service sector, are fundamentally different than those of an off-line form of interaction. On-line interaction places a premium on a set of skills that combines a degree of reflection (based on prior knowledge) with reflex (the ability to take immediate action). To solve problems in this new interactive work setting, operators must draw upon a large body of formal pieces of information just at the threshold of perception. Since the solution must be found rapidly, 'patterns' must exist to help the operator interpret the signals received and relate them to the problem. This new type of computer-mediated form of problem solving requires that training programs provide workers with "patterns of interpretation" that can be applied to work situations rather than just formal knowledge or a specific set of skills (d'Iribarne, 1987: 8). In effect,

> workers in cybernated systems cannot function as passive machine tenders, looking to instruction manuals for the appropriate response. This suggests an entirely new definition of work in a post-industrial setting. Skills can no longer be defined in terms of a particular set of actions, but as general ability to understand how a system functions and to think flexibly in trying to solve problems (Hirschhorn, 1982: 45).

5 New Skill Requirements and the Educational System

In light of these trends, there is growing interest in the concepts of continuing education, retraining, and learning on the job. Traditional skill requirements will be substantially modified and change frequently; the more integrated the technology, the more integrated will be the required skills. Clearly, primary and secondary education will remain a critical factor in ensuring that the workforce of the future is adequately prepared. This is particularly true for countries such as the United States and Canada, where high levels of functional illiteracy remain a major impediment to our future economic prosperity (Creative Research Group, 1987). There is also recognition of a need to increase the emphasis in education on mathematical skills and basic technological literacy, so that workers can be prepared to use the new technology. Anticipating the precise future needs for training will be difficult. As the pace of technological change accelerates, the relationship between education or training and the precise content of particular jobs will become more tenuous. The emphasis in the relationship between education and work will need to shift towards the ability to master new skills in a future job (Sorge, 1982: 14).

The prospective demands of the new techno-economic paradigm make it unlikely that the skills acquired by students in their primary or secondary education will remain adequate through the entire course of their working careers. The nature of the required changes is less in the order of learning a new set of hard skills to replace a previous set (for example, mechanical drafting with CAD). Rather, workers must be prepared to adjust their skill levels, and acquire related skills, on an ongoing basis. This need was repeatedly emphasized in the consultations held for Study Team 2.[3] The challenge posed by these developments was cogently summarized by the Skill Development Leave Task Force of Employment and Immigration Canada,

> When information is automatically handled at all levels, new life skills are called for. People will have to accept lifelong learning. Retraining, upgrading and updating will become an integral part of their movement through life. It is unlikely that education will ever again be something one does only during youth (Employment and Immigration Canada, 1983: ii).

A recent report prepared for the Social Planning Council of Metropolitan Toronto identified three categories of labour force participants (in addition to new entrants) in need of skill upgrading: 1) currently employed workers who are confronted by technological change or whose jobs are threatened by increased international competition for their firm's product or service; 2) recently displaced workers with "obsolete" skills; and 3) the employment disadvantaged including the long term unemployed, labour market entrants/re-entrants, social assistance recipients, and other groups who face substantial barriers in their entry to the labour market (Yalnizyan and Wolfe, 1989: 101).

Post-secondary institutions, particularly the college system, will face a challenge in deciding what kinds of training to provide for which categories of labour market participants. The specific skill requirements of each of these categories may be different and their educational preparation may vary. Furthermore, the current pace of technological change will make it difficult to anticipate the exact vocational and skill needs of each. Although the emphasis in the college system to date has been directed towards new labour market entrants, the environmental scan prepared for Vision 2000 emphasizes that the other three categories are likely to assume greater significance in the coming decades (Vision 2000, 1989: 28-35).

The process of economic dislocation engendered by the transition to a new techno-economic paradigm will greatly increase the educational needs of workers in the first and second categories. The decline of employment in some industries and the expanding demand for labour in others will place a premium on the quality of education and training that will facilitate intersectoral mobility. Evidence from the study of the changing occupational and skill composition of the steel and electronic industries indicates that industrial workers forced out of their traditional occupations and industries suffer most in terms of duration of unemployment and loss of earnings. The reasons for these losses are linked to the traditional role played by internal labour markets in the process of skills development. The economic dislocation engendered by the current restructuring and technological change has seriously reduced this role. As a consequence, the demands placed on those institutions within the educational system that can provide new skills for adult workers will increase. The preeminent role played by the college system in providing specialized open access to adult learners makes it the most logical candidate to fill this need (Warrian, 1989: 11-16).[4]

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[3] There appear to be some differences in interpretation between the exact meaning associated with the term "lifelong learning" by employers and employees. Unions are suspicious that employers' interest in lifelong learning extends only to the specific skills they want their workforce to acquire, rather than a more general upgrading of the individual's education levels. Despite this difference, both concur that there is a growing premium attached to "learning to learn" skills (Gill, 1989).

In addition, the declining pool of new labour market entrants will also place a premium on the potential skills and economic contribution of those groups that have conventionally been labelled employment disadvantaged. These groups, who face a variety of barriers in gaining adequate employment, will constitute a valuable pool of labour supply in the future, and an important potential constituency for the college system. As the Armstrongs argue in their paper, some have skills that are no longer in demand and others lack the appropriate set of skills, the necessary literacy, or the basic education needed for the jobs now available in the labour market. The challenge for the college system will be to provide these groups — the disabled, women, older workers, the poor, diverse racial and cultural groups, and Native people — with the education and training they need to overcome the existing barriers to their employment (Armstrong and Armstrong, 1989: 8-32).

Regardless of their specific vocation, or their educational background, each of these target groups will share with new labour market entrants the need for more fundamental skills and greater technological literacy. The colleges must respond to their expanding educational needs in a flexible and creative manner. They will have to provide customized learning packages which address the diverse needs of their clients on both the demand (employer) and supply (students) side of the labour market. In a sense, the colleges will need to adopt the same principles for the flexible provision of education that constitute the best practice frontier of management. They need to develop an increasingly heterogeneous system, but coordinate it in a way that maintains strong system-wide sharing of development, standards, and innovation, while simultaneously differentiating between the learning needs of various client groups.

Despite the diverse array of learner needs to be met and the uncertainty involved in predicting the specific skill and occupational requirements of the labour force, certain facts hold constant. Both employers and students recognize the growing need for fundamental or generic skills in the emerging information intensive economy. The distinction between fundamental, or generic, skills and application, or workplace specific, skills was emphasized repeatedly in the consultations carried out by Study Team 2. Participants in virtually every sector consulted emphasized the need for these fundamental or generic skills (Gill, 1989: 2-3). Similarly, the employers in the steel and electronics sector consulted by Warrian described this need for fundamental skills as a "functional requirement for the current workforce to be effective on the shopfloor of the 1990s, and as a base for future application specific training" (Warrian, 1989: 17).

Different national systems of education and training have adopted different approaches to the transmission of each category of skills. In one approach, more characteristic of the Anglo-Saxon democracies and Sweden, the educational system is responsible for transmitting most of the specialized skills required in a job setting. On-the-job or workplace related training is limited to short-term upgrading related to specific tasks or the requirements of new equipment. In the second approach, characteristic of Japan and, to a lessor extent, West Germany , the educational system is expected to provide students with the fundamental preparation required for later training. Heavy reliance is placed on workplace-based training to develop more specialized task related skills. In the Japanese approach, this is closely tied to the concept of the "factory as laboratory" and the notions of "learning by doing." Much of the important innovations in Japanese products and processes emerge out of this process of continual learning and improvement as part of production (Dertouzos et al., 1989: 83-88).

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[4] For an equally convincing account of the changing role of the internal and external labour markets as the source of skills development for employees in service sector industries, cf. Noyelle, 1987.

Several recent investigations by researchers have concluded that the latter approach may be better suited to providing the skills and training appropriate to the new techno-economic paradigm than the former. The West German and Japanese approaches divide the educational process between fundamental and workplace specific skills in a less functionally differentiated manner. Broader skills acquired as part of their fundamental education increase workers' ability to acquire new skills as part of the work process. Further, a greater emphasis on workplace related training enables workers to develop a systemic understanding of how their job relates to the broader context of the work process. The heightened pace of technological change also makes it more difficult for educational institutions to ensure that their training programs remain current with the specific needs of individual firms.

In light of the considerable uncertainty about future requirements for specific skills and the increasing importance of workplace centred learning, there is a growing consensus that the educational system should place greater emphasis on the transmission of fundamental skills. Education emphasizing fundamental skills, such as cognitive ability, intellectual flexibility, and problem-solving capacities are more likely to provide workers with the foundation to develop and redevelop their specific vocational skills (Spenner, 1988: 171). One West German researcher argues that, "(w)hat firms need today is not just skills but broad and unspecific skills; not just 'functional' skills dedicated to a specific purpose, . . . but skills as a generalized, polyvalent resource that can be put to many different and, most importantly, as yet unknown future uses" (Streeck, 1989: 97).

Given the growing importance attached to the concepts of fundamental or generic skills, they need to be refined more precisely. The concept of fundamental skills can be construed as having four dimensions: analytical problem solving skills, functional literacy, technological literacy and interpersonal and communications skills.[5] The greater need for analytical problem solving skills arises from the pervasiveness of computer-mediated work discussed above. The abstract skills required are those that allow workers to deal more effectively with informational representations of reality, or what Zuboff calls "the electronic text." Increasingly, workers in a wide variety of job situations require general problem solving skills based on the ability to visualize parts of a process in relation to the whole and to translate from abstract principles to concrete situations and back again.

> The construction of meaning from the electronic text that now represents the production process is likely to require more deliberate, controlled, aware, cognitive effort than earlier action-centred, context-dependent routines. The reason involves the nature of the inference process that links environmental clues with a meaningful response. When those clues are primarily concrete, the inference process can remain relatively implicit or tacit. When those clues are primarily abstract, meaning must be constructed through an explication process that assigns referents and analyzes relationships (Zuboff, 1988: 191). .

In addition to these abstract analytical skills, workers will require a higher degree of functional literacy. The problem of literacy has attracted a great deal of attention recently, especially in light of the highly publicized Southam study. However, the real issue with literacy extends far beyond the simple ability to read. The requirements of literacy on the job are increasingly more sophisticated and complex than the reading skills taught in most secondary institutions. Reading in school usually involves memorizing facts from prescribed texts in order to answer preset questions. On-the-job literacy requirements, in contrast, extend the range from reading technical manuals for new equipment, training manuals, company reports, tables, diagrams, and printouts, in order to accomplish a prescribed task. Understanding the material being read requires the ability to interpret and apply the general principles articulated in the report or manual to the context of the specific situation encountered on-the-job. Academic studies of literacy seriously question the extent to, and effectiveness with, which school-based learning transmits the requisite skills. Students would benefit substantially if literacy training involved a greater degree of applied analysis of reference material, such as government statistical reports, rather than reading from prescribed texts (Mikulecky, 1989).

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[5] These four dimensions are referred to as the "four pillars" by a number of the employers consulted by Warrian (1989: 17).

There is a growing consensus, among both researchers and practitioners in the field, that functional literacy cannot be taught in discrete components of the curriculum, especially for adult learners. Rather the teaching of literacy in the sense described by Mikulecky must be incorporated across all aspects of the curriculum, in the sense referred to as literacy or writing across the curriculum. The rationale for this approach is cogently summarized in the recent resource guide prepared by the Heads of Language Executive for the colleges.

> The Writing across the Curriculum movement is premised on the idea that writing is fundamental to learning; writing should be a crucial part of the thinking process that engages students in learning and enables them to master material. Writing and thinking are inextricably linked in at least three ways:
>
> 1. Writing makes thinking and learning active. Rather than being passive receivers of material, students must be actively involved and engaged to write. They must encounter ideas, originate responses, synthesize knowledge, and produce a tangible record of these processes.
> 2. When students write, they gain access to previous knowledge and experience. Writing about a subject enables a person to call up what is already stored in memory and relate it to new concepts, facilitating mastery of complex material.
> 3. Writing makes thought visible. It develops, modifies, and extends the thinking process. As such, it is the most powerful means of ensuring sustained critical thought. When teaching involves the students in writing, their thinking is likely to be clearer and they learn more (1989: 2).

In addition to higher levels of analytical skills and functional literacy, future workers will require a greater degree of technological literacy. The current wave of innovation has spawned a fascination with information technologies throughout the educational system. All too often, this has taken the form of teaching computer programming to primary level students or teaching word processing to secondary level and college students. These efforts fall far short of providing students with the requisite background in technological literacy. Technological literacy is predicated on a basic grounding in science, math, literacy, and some computer skills. Building on this foundation, it includes the analytical skills that allows students and workers to integrate this knowledge base and apply their understanding of its concepts to a continuously changing information base in the future (Lemons, 1984: 23). Essential to this knowledge base is a grounding in the basic properties of the core technologies of the emerging paradigm. In addition to specific programming or word processing skills, students will need an understanding of the physical and electronic properties of electronic components and the fundamental principles of Boolean algebra at the core of computer technology. This grounding in basic technological concepts will facilitate their ability to adapt to new technologies and apply new forms of software as they are encountered in job settings. These points were emphasized by employers, such as Stelco and Honeywell, interviewed by Warrian (1989: 22).

The final element of these fundamental skills is increased interpersonal and communications skills. As was noted above, the emerging paradigm of best industrial practice is producing a radical shift along the autonomy-control dimension of skill. A wide variety of work settings in the emerging techno-economic paradigm call for a greater degree of teamwork in manufacturing settings or higher levels of interaction between service sector workers and their clients. This shift along the skill dimension, places a high premium on the ability of workers to interact and communicate effectively with their co-workers or their clients. Employers consulted by the Study Team stressed the need for these skills: the ability to work in teams, understand workplace structures, and take responsibility and initiative (Gili, 1989).

The challenge for colleges and other elements of the educational system is to structure these components of fundamental skills into every aspect of their curriculum programming. The range of fundamental skills required by the technologically literate workers of the new techno-economic paradigm cannot be taught as a discrete component of an increasingly specialized curriculum. Rather, they involve fundamental and generic skills that should form the basis of every aspect of the curriculum. The colleges will continue to provide generic technology skills to their students, such as CAD or SPC, as well as specific technology training on a commissioned or cost recovery basis. However, the truly distinctive role for the college is recognized as the provision of the fundamental skills and pretechnology education for an increasingly diverse array of new labour market entrants and adult learners. Once again, there was a broad and general consensus throughout the consultations that the public education system in general, and the colleges in particular, are uniquely qualified to fill this role (Gill, 1989: 4).

6 Education, Skills and International Competitiveness

How effectively we respond to the challenges outlined in this paper has grave implications for the future wellbeing of our society. Although the implications of this challenge extend far beyond the realm of the colleges, the college system is in a unique position to play a leadership role. Its response to these challenge may help determine the standards of living enjoyed by a future generation of Canadians. The ability of nations to compete effectively in the emerging global economy has been linked to their prevailing "national systems of innovation." This new national system of innovation is based not merely on superior performance in research and development, but on a broad array of social and institutional arrangements that foster rapid adjustment to changing conditions. Central to these arrangements is the identification of education and training as key factors in the process of innovation and adaptation (Freeman, 1987b: 31).

Detailed studies of the innovation process reveal that it is not something which only occurs in the laboratory and is then transferred to the factory. Effective innovation is integrally tied to every phase of activity of the firm. Innovation is as much an output of the production process itself as it is of the laboratory. Technical knowledge does not exist merely in the designs and blueprints of scientists and engineers; it includes a complex set of skills, knowledge, and techniques, shared by many members of the enterprise, including its production workforce, and embodied in the activities of design and production. Furthermore, this source of technological knowledge and insight is not separable into discrete product categories. It is cumulative and dynamic. Insights gained by managers, scientists, engineers and production workers in the design and manufacture of one product may transfer into significant new insights and comparative advantages useful in the production of others as well.

Given that technological advance involves a collective process of learning, both within the enterprise and in the broader society, the course charted today for the future direction of the college system will help determine our technological capability for the future. Technological knowledge and capabilities are diffused not through the sale of products or blueprints in international markets, but through national or regional communities which share a certain base of knowledge and the increments to that knowledge base. From this perspective, technical knowledge accumulates through a process of learning by doing in the layers of engineers and skilled workers that comprise the enterprise.

Investments in enhancing technological knowledge at every level of society will pay significant dividends in the future. The key to international competitiveness involves the cumulative technological knowledge base of society, including the production skills and tacit knowledge of much of the workforce. This represents a fundamental break with the production logic which underlay the system of standardized mass production that prevailed throughout the postwar period. Overall, the key to success in the emerging technological era appears to be a commitment to training and a willingness to empower workers with skills and greater autonomy. The role of the college system in transmitting the fundamental skills needed by a diverse array of learners will be critical in providing the skill and knowledge base essential for this innovative process. The success with which the college system responds to this challenge will determine the ease with which Ontario makes the transition to the new techno-economic paradigm.

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Colleges
and the
Changing Economy

Background Papers

Peter Warrian
Peter Warrian and Associates

Industrial Restructuring, Occupational Shifts and Skills: The Steel and Manufacturing Cases

Study Team 2

Industrial Restructuring, Occupational Shifts and Skills: The Steel and Electronic Manufacturing Cases

Summary

Recent changes in skill requirements and occupational composition in the steel and electronic manufacturing industries may be considered representative of future skills development in Ontario's industrial economy. These will set the framework for the training requirements in the economy of the 1990s. Ontario's Community College system will be challenged to re-consider its structure of delivery, emphasis, and methods of teaching in order to meet them.

Restructuring driven by international market forces or technology as an opaque, if not invisible hand, cannot be assumed to produce the value-added restructuring necessary for the Ontario economy to sustain the social environment the Premier's Council has endorsed. Active labour-market and training policies will be vitally necessary if the goals of enhanced value-added production in Ontario are to be realized. It is within these broad international economic and technological forces that the Community College system can contribute to positively enhancing value-added production by helping provide an adequately and currently skilled workforce to drive the economy of the future.

As this paper points out, the analysis of the dislocated worker labour-market problem has established that internal and external labour-market issues cannot be separated. They are but aspects of the same issue. This means in turn that the upside and the downside labour-market adjustment issues are also the same. The re-skilling or up-skilling of the workforce is necessary to both the realization of the enhanced value-added goods-producing sector for the Ontario economy and to ease the negative impacts on workers of industrial restructuring. In addition, the colleges have an important proactive role to play in altering the training culture by supplying education and initiating occupational/credential changes which diversify the internal labour market in a way that enhances value added.

There have been important occupational shifts taking place in recent years in both the steel and the electronic manufacturing industries. In both cases, 'knowledge intensive' occupations tend to gain, while 'labour-intensive' occupations have been losers in both industries. Within the production workforces, the traditional electro-mechanical skills have been in decline, while electronic and information-related skills have been in the ascendancy.

The following general conclusions are supported by the results of field interviews.

1. The first task is to equip the current and future workforce with a solid base in the fundamental skills of literacy, numeracy, communications, and problems solving.
2. The Colleges in their technology and other vocational training activities should concentrate on giving a good grounding in applied generic skills. The application and firm-specific training should be left to individual firms.
3. Colleges may co-operate in delivering short-burst, customized training in co-operation with local industry for both general upgrading and specific applications.
4. In spite of the general patterns of upskilling, industrial restructuring will also have a labour adjustment downside affecting specific localities, occupations, and industries. The role of the College in these cases should be the enhancement of the portable fundamental skills and generic applied skills that these workers will need to be re-employed.

La restructuration industrielle, la transformation des métiers et des aptitudes : la situation des industries de la métallurgie et de l'électronique

Sommaire

Les changements qui sont survenus récemment par rapport aux aptitudes requises et à la nature des métiers dans les industries manufacturières des secteurs de la métallurgie et de l'électronique semblent représentatifs des futurs besoins en matière de formation professionnelle au sein de l'économie industrielle de l'Ontario. Ces changements détermineront la nature de la formation professionnelle dont notre économie aura besoin pendant les années 1990. Pour être en mesure de répondre à ces besoins, le réseau des collèges communautaires de l'Ontario sera forcé de reconsidérer la structure de la prestation des programmes d'études et la nature des méthodes pédagogiques.

Cette restructuration, qui découle des pressions exercées par les marchés internationaux ou des changements technologiques, est à peine perceptible, sinon invisible, et ne produira pas nécessairement la valeur ajoutée dont l'économie de l'Ontario a besoin pour soutenir l'environnement social proposé par le Conseil du premier ministre. Une main-d'œuvre active et des politiques de formation professionnelle seront indispensables pour atteindre les objectifs d'accroissement de la valeur ajoutée de la production en Ontario. Dans le contexte de ces pressions économiques et technologiques internationales, le réseau des collèges communautaires pourra contribuer à accroître la valeur ajoutée de la production en assurant la formation d'une main-d'œuvre compétente dont notre économie aura besoin.

Comme le souligne le document, l'analyse du problème de la dislocation de la main-d'œuvre démontre que les questions relatives aux marchés du travail intérieur et extérieur sont indissociables. En fait, ces marchés ne sont que des aspects différents d'une même question. Ceci signifie que les questions relatives aux avantages et aux inconvénients de l'ajustement de la main-d'œuvre sont également indissociables. Le recyclage ou le perfectionnement de la main-d'œuvre est nécessaire à l'accroissement de la valeur ajoutée de la production du secteur manufacturier de l'économie ontarienne et pour atténuer les répercussions négatives de la restructuration industrielle sur les travailleurs. De plus, les collèges ont un important rôle à jouer dans la transformation de la culture de formation.

Au cours des dernières années, il s'est produit une transformation importante de la nature des métiers dans les industries manufacturières des secteurs de la métallurgie et de l'électronique. Dans ces deux secteurs, les métiers «à prédominance de connaissances» ont tendance à augmenter, tandis que les métiers «à prédominance de main-d'œuvre» ont tendance à diminuer. Dans le cas des métiers liés à la production, ceux qui exigent des aptitudes traditionnelles en électromécanique connaissent un déclin, tandis que ceux faisant appel à des aptitudes en électronique et en informatique connaissent une hausse.

Les entrevues réalisées permettent de tirer les conclusions suivantes :

1) L'objectif premier est de fournir à la main-d'œuvre actuelle et future une solide formation de base en lecture et en mathématiques, de même que des aptitudes de communication et des aptitudes permettant de résoudre les problèmes.

2) Les activités de formation technologique et professionnelle des collèges devraient surtout être orientées vers l'acquisition de bonnes aptitudes générales de base. La formation relative à l'application des aptitudes ou à leur adaptation aux besoins particuliers des entreprises devrait être laissée à chaque entreprise.

3) Les collèges pourraient collaborer avec l'industrie locale dans le but d'offrir des programmes de formation à court terme et personnalisés dans le domaine du recyclage général et de l'application particulière des aptitudes.

4) Malgré la tendance générale en faveur du recyclage, la restructuration industrielle aura des répercussions négatives sur l'ajustement de la main-d'œuvre dans certaines localités, dans certains métiers et dans certaines industries. Dans ce contexte, le rôle des collèges devrait être d'améliorer les aptitudes de base et les aptitudes générales appliquées dont ces travailleurs auront besoin pour réintégrer le marché du travail.

Table of Contents

		Page
	Introduction	1
I	Background	1
	Recent Employment Trends	2
	Changing Occupational Composition	2
	Labour-Market Policy and Training	5
	The Labour-Market Downside	5
II	Results of Field Research	8
	Fundamental Skills: The Four Pillars	8
	Literacy and Technological Literacy	10
	Team Manufacturing Skills	11
	Generic Applied Skills	11
III	Role of the College	12

Introduction

In the companion piece to this paper, "Educational Implications of the New Techno-Economic Paradigm," David Wolfe discusses the trend in the new paradigm towards higher and broader levels of skill and for greater flexibility in the way that skills are deployed in the labour process. Due to the variable nature of the skill effects of the new technology, it is increasingly difficult to forecast which set of specific skills will be needed in the future. Further, technology and its use are changing so rapidly that many observers argue that specific skills are less important than the ability to think independently, learn quickly, be flexible, and work with others. Workers can no longer function with the knowledge of one single skill or how to run one machine.[1]

It is argued that this means that the traditional skill requirements will be substantially modified and will frequently change. Given the historical contribution of Ontario's Community Colleges to training and retraining the workforce, change will be a constant for the college system. As well, there is a need to reconsider the content of training delivered through the college system. There will be a need to increase the emphasis on mathematical skills and basic technological literacy so that workers can be prepared to use the new technology. Anticipating the precise future needs for training will be difficult. As the pace of technological change accelerates, the relationship between education or training and the precise content of particular jobs will become more tenuous.[2] In summary, the changed and indeterminate specific content of working skills may serve to enhance the role of the colleges in fundamental skill training in the future.

The following paper seeks to apply this analysis to the specific cases of the Canadian steel and electronic manufacturing sectors. The presentation will be in two parts: 1) a consideration of recent occupational shifts in the two industries; and 2) results of field visits with industrial sites in the two sectors. The concluding section of the paper will suggest some implications of these findings for the role of the colleges in the future Ontario industrial economy.

I Background

The steel industry and electronic manufacturing industry are vital parts of Ontario's industrial heartland. Both industries account for a substantial proportion of Ontario's value-added manufacturing and a disproportionate level of manufactured exports. It is these specific attributes that place both industries near the centre of the value-added industrial restructuring strategy proposed for industrial policy focus in the Ontario Premier's Council Report *Competing in the New Global Economy.*[3]

Canadian steel industry production is concentrated in Ontario. The restructuring pressures of the 1980s have resulted in a steel industry focus on specialized steels with advanced metallurgical and quality characteristics that emphasize high value-added production. The steel industry is a major consumer of high technology industrial applications for steelmaking, processing, and monitoring systems. Site visits were made to Stelco and Algoma steel — representing the traditional basic producer end of the industry; and, Lasco — representing the electric furnace sector of the industry.

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[1] David A. Wolfe, "New Technology and Education: A Challenge for the Colleges," Background paper prepared for Study Team 2, Colleges and the Changing Economy, Vision 2000, Ontario Council of Regents, June 1989.

[2] Ibid.

[3] *Competing in the New Global Economy*, Report of the Premier's Council, Toronto, 1988.

Electronic manufacturing in Ontario includes large and diversified corporations and small focused businesses which both manufacture and utilize electronic manufacturing equipment driven by the microelectronics revolution. Visits were made to Camco's computer-integrated manufacturing appliance plant in Hamilton and units of Honeywell-Bull producing advanced control systems.

Recent changes in skill requirements and occupational composition in the steel and electronic manufacturing industries may be considered representative of future skills development in Ontario's industrial economy. These will set the framework for the training requirements in the economy of the 1990s. Ontario's Community College system will be challenged to reconsider its structure of delivery, emphasis, and methods of teaching in order to meet them.

Recent Employment Trends

Both the Canadian steel industry and the electronic manufacturing industry have both suffered the employment losses associated with goods-producing industries across all industrial economies in the late 1970s and the first half of the 1980s. The steel industry workforce declined from 94.2 thousand to 78.8 thousand between 1981 and 1986. This represented a decline of 16.4%. During the same period, the electronic manufacturing industry workforce declined from 150.4 thousand to 148.1 thousand, a decline of 1.53%. Since 1986 steel industry employment has held relatively steady. Electronics has continued to increase and by 1988 had surpassed, in aggregate, its previous employment peak of 1981.

The aggregate trends in employment reinforce the popular conception of the steel industry as a classical, declining 'smokestack' industry, while the electronic manufacturing industry is perceived as a 'growth' industry.

Changing Occupational Composition

However, within these aggregate employment figures there have been important occupational shifts. The internal shifts within these industries in fact suggest a convergence of occupational and skill trends.

As the following tables indicate, the general decline in employment in the steel industry has been far from evenly distributed. There have been clear trends in employment gainers and losers.

Table 1

Employment Gainers	Employment Losers
Management	Metal Processing
Administrators	Metal Shaping
Engineers	Industrial Mechanics
EDP Operators	Clerical
Electronic Technicians	

Table 2
Steel Industry Occupational Changes 1981-86 (In thousands)

	1981	1986	% Change
Management-Administration	3.0	3.4	13.3
Other Management	1.4	2.2	57.1
Engineers	2.0	1.9	-2.0
Engineering Technologists	0.9	0.8	-9.8
Systems Analysts	0.5	0.7	-9.8
Steno, Typist, Bookkeeper	3.7	3.0	-18.9
Production clerks	3.4	2.6	-23.5
General office clerical	0.9	0.8	-5.4
Sales	1.5	1.3	-16.0
Metal Processing	21.2	15.9	-25.0
Foremen	3.3	2.9	-12.1
Metal Shaping	14.1	11.4	-19.2
Foremen	1.5	1.2	-20.0
Electrical Repair	1.4	1.2	-14.3
Industrial Mech	4.6	3.8	-17.4
Materials Handling	7.6	6.2	-18.4
Total	94.2	78.8	-16.4

While the overall employment patterns in the electronic manufacturing industry have been both more stable and more positive, at the same time there have been equally important changes in the 1980s. As Table 3 indicates, the electronic manufacturing industry has been characterized by an equally, if not more diverse, pattern of internal employment growth and declines.

Table 3

Employment Gainers	Employment Losers
Managers	Metal Processing
Administrators	Machinists
Technicians	Machine Operators
System Analysts	Electrical Assemblers
EDP Operators	Inspectors
Sales	Materials Handling
Wire Communications	

Table 4
Electronic Manufacturing Industry
Occupational Changes 1981-1986 (in thousands)

	1981	1986	% Change
Management-Administration	10.8	14.2	31.5
Engineers	7.1	9.4	32.4
Engineering Technicians	5.1	5.6	9.8
Systems Analysts	1.6	3.1	93.8
Stenographer, Typist, Bookkeeper	5.1	4.9	-3.9
Production clerks	7.8	6.6	-15.4
Sales	5.2	5.5	5.8
Metal Processing	3.4	1.9	-44.1
Metal Machining	5.1	3.4	-33.3
Metal Shaping	6.5	4.6	-29.2
Assembly-Service	43.6	39.7	-8.9
Electrical Repair	3.9	4.5	15.4
Material Handling	3.5	2.7	-22.9
Total	150.4	148.1	-1.53

As the previous tables indicate, there have been important occupational shifts taking place in recent years in both the steel and the electronic manufacturing industries. In both cases, 'knowledge intensive' occupations tend to gain, while 'labour-intensive' occupations have been losers in both industries. Within the production workforces, the traditional electro-mechanical skills have been in decline while electronic and information-related skills have been in the ascendancy.

This trend is confirmed when the internal distribution of occupational groupings is considered for each industry, offset for aggregate employment trends, as indicated in Tables 5 and 6.

Table 5
Steel Industry
Occupational Distribution 1981-86 (in thousands)

	1981	Percent	1986	Percent
Management	1.7	2.7	5.6	10.1
Sales	3.4	5.4	3.5	6.3
Clerical	8.0	12.6	6.5	11.7
Technical	1.5	2.4	1.3	2.4
Production	48.9	77.0	38.5	69.5

Table 6
Electronic Manufacturing Industry
Occupational Distribution 1981-86 (in thousands)

	1981	Percent	1986	Percent
Management	10.8	9.9	14.2	13.4
Sales	13.8	12.7	18.1	17.1
Clerical	12.9	11.9	11.5	10.8
Technical	5.2	4.8	5.5	5.2
Production	66.0	60.7	56.8	53.5

For both industries, there has been significant growth in the management, sales, and technical occupational groups. At the same time, the production and clerical workforces have been declining in absolute and relative terms.

Labour-Market Policy and Training

The implication of the above survey of shifts in the occupational structure of the steel and electronic manufacturing industries is that there has been a net reskilling of the workforce in both industries. This result runs counter to the fears in some quarters that the impact of new technology and industrial restructuring is to deskill the workforce. In conjunction with general demographic trends, this pattern implies that there will be an important role for Ontario's community colleges in training and retraining the workforces for these industries in the future, both in terms of training the new entrants (who will comprise a smaller proportion than in the past two decades) and retraining the existing workforce. The latter point should be emphasized, because as the recent federal De Grandpre report states, at least 60% of the workforce of the Canadian economy in the year 2000 is already employed in the offices, factories, and laboratories which we now have.[4]

While the above data are suggestive, it would be a mistake to make a presumption that the nature of shifts in industrial structure towards increased value-added, or inherent in the new technologies themselves, are necessarily trends towards re-killing. Neither can one assume, in terms of 1970s industrial sociology debates, an inherent 'deskilling' skilling trend. Restructuring driven by international market forces or technology as an opaque, if not invisible, hand cannot be assumed to produce the value-added restructuring necessary for the Ontario economy to sustain the social environment the Premier's Council has endorsed. Active labour market and training policies will be vitally necessary if the goal of enhanced value-added production in Ontario is to be realized. It is within these broad international economic and technological forces that the Community College system can contribute to positively enhancing value-added production by helping provide an adequately and currently skilled workforce to drive the economy of the future.

The Labour-Market Downside

The previous discussions of recent changes in the occupational composition of the steel and electronic manufacturing industries, if accurate, portray the upside of the labour-market adjustment issue to which Ontario's community colleges can contribute. It is relatively easy and uplifting to describe the potential role of the colleges in reskilling the workforce. However, as the data from the steel and electronic manufacturing industries themselves indicate, there will also be a substantial amount of downside labour adjustment and worker dislocation, even within growth industries and sectors. A not insignificant proportion of Community College enrolment is accounted for by trainees from the temporarily or permanently unemployed industrial workforce whose placement in the college system arises from provisions of the Unemployment Insurance, federal and provincial manpower retraining programs. Recent data gathered from the steel and electronic manufacturing sectors point to the dimensions of the problem.[5]

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[4] *Adjusting to Win*, Report of the Advisory Council on Adjustment, Ottawa 1989.

Table 7
Cumulative Layoffs:
Selected Ontario Industries 1981-87 (in thousands)

	Layoffs	% of Total Layoffs
Primary Metal	17.9	15.4
Transportation	31.5	27.1
Electrical	17.8	15.3

Workers in the steel industry, along with electronic manufacturing, join those in the auto industry in representing a disproportionately high number of layoffs. Together, these industries represented almost 60% of the total cumulative layoffs in Ontario between 1981 and 1987.

However, the story does not stop there. Not only do workers in these basic industries suffer a higher proportion of layoffs, their experience of layoff, unemployment, and re-employment are different from the majority of the workforce.

Workers laid off in the steel and electronic manufacturing industries on average experience five to ten weeks longer periods of unemployment than the general average for the workforce as a whole.[6]

Table 8
Distribution of Duration of Unemployment
Weeks of Unemployment

	<5	5-12	13-25	26-51	51+
Steel	17%	18%	27%	15%	24%
Electronic	16%	18%	23%	27%	16%

As the table indicates, over 40% of the workers dislocated from the steel and electronic manufacturing industries face unemployment of six months to a year or longer, in addition to the general average duration of unemployment's being longer.

In respect to both duration of unemployment and loss of earnings, it is when industrial workers have to move out of their traditional occupations and industries that they suffer their worst losses. In addition to the prolonged unemployment such dislocated industrial workers experience, they also suffer on average a loss of wages equal to 36% of their former average wage. This is contrasted with those who are re-employed within the industry who maintain their earnings or even show gains over time. The patterns are indicated from the following recent survey of dislocated workers in several Southern Ontario industries and locations.[7]

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[5] *Connections for the Future*, Report of the Joint Human Resources Committee of the Canadian Electrical and Electronic Manufacturing Industry, Toronto, November, 1988.

[6] *Lessons of GE Peterborough and NT London*, Joint Human Resources Committee of the Canadian Electrical and Electronic Manufacturing Industry, Toronto, November, 1988.

Percentage Change in Earnings
After Separation ($1981)

Region/Industry	Same Company	Same Industry	Other Industry
Peterborough Electrical	7.0	—	-19.9
Peterborough Auto	9.7	—	-13.3
London Electrical	—	—	-24.6
London Auto	7.5	—	-24.2
Toronto Electrical A	1.1	-0.4	-8.1
Toronto Electrical B	10.9	30.0	-18.7
Toronto Auto	11.2	-13.2	-10.9

The above data are consistent with the findings of recent studies in the United States.[8] Research into the 'dislocated worker' problem indicates that what is at issue is not simply problems of matching and effectiveness of job-search behavior, which has been the premise of unemployment insurance and labour-market policy initiatives which have dominated the 1980s policy debates. The above-average levels of unemployment duration and earnings loss are rooted in the internal markets of firms in basic industries. The typical pattern is that entrance to the internal labour market of the firm is restricted to basic skill requirements and performance. Within the internal labour market, the occupational structure is restricted to narrow, hierarchical skill and job structures, with the result that, if industrial workers lose their place within the firm, or even worse within the industry, they have very few if any portable skills to translate into relatively rapid re-employment and re-establishment of their earnings attainment. For these reasons, the internal labour-market policy problem of the firm cannot be separated from the external labour-market policy issue in the broader economy.

The fate of industrial workers suffering prolonged unemployment and deep losses in earnings is intimately related to the training culture and skills-development strategies of the industries from which they spring. Neither can be adequately analyzed apart from the other.

The analysis of the dislocated worker labour-market problem has established that the internal labour-market and external labour-market issues cannot be separated. They are but aspects of the same issue. This means in turn that the upside and the downside labour-market adjustment issues are also the same. The reskilling or upskilling of the workforce is necessary to both realize an enhanced value-added goods-producing sector for the Ontario economy and to ease the negative impacts on workers of industrial restructuring. In addition, the colleges have an important proactive role to play in altering the training culture by supplying education and initiating occupational/credential changes which diversify the internal labour market in a way that enhances value-added.

Workers dislocated out of traditional industries and traditional occupations form an important base of enrolments in the Ontario Community College system. Given the demographic trend, the 'Baby Bust', and the pervasive economic restructuring the Ontario industrial base is undergoing, retraining dislocated workers can be counted as a continuing and increasingly major role for the colleges in the future.

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[7] Ibid. p.6-10.

[8] Paul Osterman, *Employment Futures*, New York Oxford University Press, 1988.

II Results of Field Research

As pointed out in the paper by Wolfe, an important distinction can be made between two different categories of skills: fundamental or pretechnology skills, and applied or workplace-specific skills.[9] The site visits and interviews with industrial managers, training personnel, and human resource managers indicate that this is a distinction they can and do readily make, and which has determinative impacts on approaches to job design, skills assessment, and training programs.[10]

Fundamental Skills: The Four Pillars

As Wolfe states, the concept of fundamental skills can be construed as having four dimensions: analytical problems-solving skills, functional literacy, technological literacy and inter-personal and communications skills.[11] Industrial managers call these the Four Pillars. Looking to the future, they regard this skill set as an entry requirement for new labour-force entrants, a functional requirement for the current workforce to be able to be effective on the shopfloor of the 1990s, and as a base for future application-specific training. Equipping people with these skills is seen to be a prime function of the education system at all levels.

A practical illustration of the issue is provided in the case of a Camco appliance plant in Hamilton. The plant is a major production facility for electrical appliances, particularly refrigerators. In the recent past they have been introducing electronic production equipment as part of a computer integrated manufacturing system of metal forming and a new paint system. On the metal forming side, on the mechanical presses, they changed to a multi-die automated process involving programmable logic control devices and the early stages of Computer Assisted Design (CAD).

The plant has a younger-than-average workforce because they were expanding at the time in the mid-80s when others were downsizing. They are also better educated on average, with 15% of the shopfloor having some post-secondary education.

The nature and application of the new fundamental skills can only be appreciated in the context of the restructuring underway in the production and co-ordination systems as a whole. Across the plant there has been an upshift in the skills in the higher level operators and trades. The skilled job classes grew in conjunction with the new equipment. At the same time, some of the lower job classes grew with the volume growth in the business. The salaried group, supervision, and middle management all declined in proportion; some declined absolutely. For instance, the ratio of first line supervision on the shopfloor went from 1:12 to 1:100. The clerical workforce decreased, with a direct drop in support service for middle management. The number of managers declined absolutely. Engineers and technicians increased. Quality control's numbers held but proportionately decreased. These developments at the plant level confirm the general shifts in occupational composition discussed in Part I of this paper.

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[9] Wolfe, Op cit..

[10] Interviews were conducted with nine company representatives of three steel companies and two electronic manufacturers. The Discussion Guide used in the interviews is included as Appendix A to this paper.

[11] Ibid, p.29

The new, fundamental shopfloor skills at the Camco plant are configured around new production and quality monitoring and co-ordination tasks expected of employees. Statistical Process Control (SPC) has been introduced across the plant. To equip the workforce in dealing with the new system, Camco has introduced problem-solving skills training, facilitation skills, and communications skills. Training programs for problem-solving have been offered to large numbers of employees. It is acknowledged by management that both hard and soft technologies are needed and have to be introduced together.

The connection between evolving skill needs on the shopfloor and the training system is direct and on-going. Their ideal would be to have half of their workforce on the job and the other half in training all the time. They current spend about 5% of payroll on training and regard this as about one-third of what they really need.

The place of the new fundamental skills is similar in the steel industry.

One profile of the Steelworker of the Nineties is the First Helper in the Melt Shop at Lasco's electric furnace facility in Oshawa. He/she not only monitors and operates the furnace, he/she also takes samples and does chemical analysis on each heat. Employees have been trained in statistical process control (Operator Process Control) techniques. They also receive training in problem-solving related to the chemical analysis and operations problems. The role of the First Helper has begun to merge with the traditional jobs in supervision and the laboratory.

The steel company management believes that for their future workforce they require literacy skills, but something that is linked to communication in the work setting, not simply classical academic literacy. As well, they need greater competence in numeracy. These skills are regarded as constituting a threshold for future trainability.

The new skills are directly linked to competitiveness. The electric furnace or 'mini-mill' sector of the steel industry has a record of being extremely competitive. However, the small Canadian market makes flexibility ever more of an issue, because their American mini-mill competition has longer production runs. The new skills and future training built upon them are regarded as strategically necessary for future flexibility and competitiveness.

At the integrated mill end of the steel industry, the problem and the profile for the solution are the same.

The Stelco Lake Erie Works (LEW) at Nanticoke is widely accepted as the most advanced steel mill in the country. A profile of the Lake Erie Works is suggestive of the future profile of the steel industry workforce as a whole. At Nanticoke, the total workforce is 1500 people: 500 supervision, technical, and staff; and 1000 hourly rated — comprised of 600 trades employees and 400 operators. In the Hot Rolled Mill, there are 140 employees: 45 operators and 95 people servicing them: supervisors, technicians, engineers, etc). There are very few supervisors; the others are process engineers, engineering technicians, planners, schedulers, computer techs, etc.

Stelco management endorses the importance of the Four Pillars of new fundamental skills and regards literacy as a vital requirement for the future, both for the renewal of the workforce and for dealing with the regulatory environment. Literacy and numeracy skills are regarded as complementary.

At the Lake Erie Works, Stelco was able to attract a large number of new employees with at least high-school education. Over 50% of the LEW workforce have post-secondary educations. Management attributes the success of the mill in no small measure to the literacy and learning abilities of its workforce.

In both the steel and electronic manufacturing industries, industrial managers see the necessity of the fundamental skills of literacy, numeracy, communications, and problem-solving as vital for the future productivity and viability of their operations. As indicated above, these will be entry-level requirements for new entrants, a functional requirement for the existing workforce, and a base for future training that is application or firm specific.

Industrial managers look to the educational institutions, the high schools, and the colleges to deliver the fundamental skills. The high schools are regarded as key to instilling the fundamental skills for the 'first-time-through' population. The colleges have a role in retraining and renewal of the workforce. The applied skills are expected to be delivered in the workplace by firms themselves, along with other private training-sector sources.

Literacy and Technological Literacy

Industrial managers, when they talk about the need for literacy, do not mean literacy in the abstract or traditional academic literacy. Bloomsbury is not the model for the control room operators in the Melt Shop at Lasco.

Management sees the need for literacy skills to be related to basic technological competencies. Together, these become the basis of both productive skill and a platform for training. The connection between general literacy and technological literacy can be demonstrated with an example from Honeywell. At the Ellesmere plant, there are three areas/stages of technological change they are currently engaged in:

1. **Automation of the Shopfloor:** Automating the equipment used for assembly on the shopfloor. The training is split 50:50 in-house and by the vendors. Its focus is equipment specific.
2. **Computer Integrated Manufacturing (CIM):** Integration of equipment and information systems hasn't yet reached the shopfloor. Personal computers are being widely used on the shopfloor but they aren't integrated. They are used to control specific equipment and quality monitoring processes. The data are used by setup and group leader personnel. This requires a basic computer literacy and SPC training. Later, more advanced training in these areas is needed. The training is all on an individual basis and specific to the equipment and workstation of an individual operator.
3. **Materials Handling:** MRP2 is a computerized materials handling and inventory system. Up to 30% are receiving specialized classroom instruction for three to five days on several occasions. Longer range, about 70% of the employees will require more generic MRP2 training.

Honeywell managers, in discussing the automation of the shopfloor in their control devices plant in Scarborough, repeatedly referred to the need for upgrading their workforce's literacy and numeracy skills in order to be able to monitor and interact with the new production technologies. A basic understanding of chips and computers was seen as needed for all. For new entrants, or as base requirements for the future workforce, basic technical competence is needed in: 1) Basic literacy and numeracy skills. 2) Generic training in production knowledge, for example production control, more SPC, process engineering, etc. These are part of raising the general level of technological skill for the future.

For the basic, Four Pillars, plus SPC, Honeywell management look outside for delivery to the educational institutions as much as inside. Afterwards, the firm can train from this base. For instance, they would take this person as a candidate for using the computer for SPC if he/she also has basic computer literacy. The next step would be data analysis and making decisions based on the numbers, identifying areas for SPC application, using it for problem-solving, etc.

Honeywell management believes that the future workforce will need a minimum Grade 12 equivalency and the following skills mix: linguistic and mathematical skills; computer literacy; and communications skills for working in Work Teams. Jobs will not be compartmentalized as they have been in the past. Everyone will be a production coordinator. New employees will have to have a minimum of Grade 12 plus the Four Pillars.

Measured against the current situation, Camco officials estimate that 30% of their workforce is functionally illiterate, one-third can get by with a kick, and one-third are good communicators. The plant manager at Camco stated that if he could start from scratch in preparing for a computer integrated manufacturing system, he would make sure that everyone learned the fundamentals of process control, communication, problem-solving, and the fundamentals of process engineering. The new system they installed was implemented by developing a series of tasks which resulted in more ability to cope with complexity. The engineering staff also learned more about the hourly employees. Good faith confidence developed on both sides, together with a confidence that each knew what the other was doing. It allowed the hourly employees to function with the equipment without having to wait for the engineer.

Team Manufacturing Skills

As the previous comments indicate, industrial managers regard improved communication skills along with literacy and numeracy skills as a base requirement for the factory floor of the future. Again, however, these are not communications skills in the abstract. The objective is to improve functional communications in the new productive setting. Workers should collectively acquire the new fundamental skills in a work group setting, acquiring group values and process skills, not a cookie-cutter version of the 3Rs.

The form and content of New Team skills and training is illustrated in the case of the Honeywell Ellesmere Avenue plant in Scarborough. Managers refer to new Work Team Technology. This is Employee Involvement for the running of each job and department. The first step is knowing about the product, customers, applications, the competition, and market changes. This is then to be applied to the specific products: valves, switches, and thermostats that they produce. Classroom sessions are focused on product and market specifics for one to three days and repeated several times per year.

Similarly, in the Camco example, there is direct interaction with the shopfloor, particularly between the engineering staff and the production employees. For example, for the new Paint System, they formed a task force on paint problems, with shopfloor employees, supervisors, and engineers. They meet once per month and do problem definition and data gathering. This has resulted in the speeding up of the conveyor system and needed improvements in dust control on the production line.

The Team Work skill and training needs for the 1990s shopfloor were best summarized by Honeywell management. As part of equipping people with the appropriate fundamental skills, there is a need for training for work in the Team environment in the 1990s. This requires a change in culture and development of social skills in both dealing with people's expectations and interaction.

In management's view, a prime need is to develop the social skills to deal with the personal and social inter-dependency of the 1990s workplace and how to handle it. No source is currently delivering training in these skills. They believe that it is needed from the schools for new entrants and from other institutions such as the Colleges for retraining the existing workforce.

Generic Applied Skills

The final set of new skills is technical skills that are generic; that is, they are technical and applied but not restricted to one specific piece or brand of equipment or production process. As examples, industrial managers refer to generic statistical process control, computer-assisted design or computer-assisted manufacturing, or even fundamental electronics skills among their technicians, operators, and tradespeople.

The need and relevance of these skills and the training associated with them are illustrated in the case of the Camco Hamilton plant. Management spent some $1.5 million on new automated door fabricating equipment from Italy. Hourly employees were sent to Italy for installation and debugging training. To assure proper maintenance of the new equipment, tradesmen were sent for the vendor-delivered training.

The latter was a failure. The tradespeople lacked an appropriate grounding in the fundamentals of electronic theory. As a result, they were afraid of breakdowns. Camco management discovered that their electricians were mostly long service employees who started out on the shopfloor as Helpers. They were very good as long as the technology and products did not change. They relied on their accumulated experience of the shopfloor. They had upgraded their skills over time through shop experience. However, when the new technology came in, it was a new ball game, and they discovered that they did not have the fundamental grounding in electrical theory as a base for absorbing the new training and coping with servicing the new equipment.

It had not occurred to management that their existing electricians had no theory or fundamentals in electronics. They had a fundamental fear of the chip and the new electronics. It was seen as more fragile and less forgiving than traditional electrical work. As a result, Camco management arranged a new training program to give refresher instruction on the fundamentals of electronic theory. Afterwards, the employees could adapt to the new technology with ease.

Another illustration of the relevance of generic applied skills comes from Algoma Steel in Sault Ste. Marie. In 1987, Algoma Steel reached agreement with the United Steelworkers on a program of multi-crafting for their electrical and mechanical trades. The major training delivery for over 1200 Algoma tradespeople is being done through Sault College's Mechanical Trades Centre. The program is a huge example of a role Colleges may play in short-burst, customized training delivery to industry. All of Algoma's tradespeople are being sent for six to eight week courses at the College. The objective of the program is to assure that they have a common and proper grounding in the fundamentals of the theory of the electrical and mechanical trades. This is followed by formal on-the-job training in a variety of multi-crafted applications.

In all these examples, in addition to the existence of fundamental skills, industrial managers see the increased importance of having a workforce that is properly trained in generic applied skills, often in the form of technician/technologist or trades skills. This foundation is increasingly important and may be more important than the traditional College-delivered training focused on proficiency in a narrow application or type of equipment.

The issue was best stated by a member of Stelco management in regard to the Instrument Technician program at Mohawk College. The Mohawk program was developed with a great deal of effort and proficiency in the 1970s and has been seen in the past as a major feather in Mohawk's cap and an example of what the Colleges 'ought ' to be doing. That may have been appropriate for the 1970s when all the instrument equipment was numeric. However, it is irrelevant in the 1990s when the equipment is all digital and electronic. What Stelco needs for the 1990s is people who understand process, how you engineer process, the fundamentals of electronics, etc. Application-specific and apprenticeship training can be done separately in industry. They do not need an over-specialized instrument mechanic, no matter how proficient.

Managers look to the Colleges to provide the fundamental grounding in generic technical skills. The specific applications training they see as the responsibility of company delivered training efforts.

III Role of the College

The interview results, taken together with the demographic and occupational shifts discussed earlier in this paper, have direct implications for the College system in the future Ontario economy. The Colleges can and are expected to play a major role in preparing and re-equipping the workforce for the new economy. It is a role that is different and more focused than the attempt in the past to try to service all demands from all constituencies. It has implications for the structure, training philosophy, and even pedagogical approaches to training and instruction by the Colleges in the past.

The following general conclusions are supported by the results of the field interviews.

1. **The first task is to equip the current and future workforce with a solid base in the fundamental skills of literacy, numeracy, communications, and problems solving.**

This applies both to new labour-force entrants and experienced workers, either employed or unemployed.

Stelco management was explicit on the impact of changing technologies and skills on the role of the Community College system. The Colleges should be looking at the general environment and not focusing on situation-specific training. They should do the generic literacy, numeracy, SPC, and work co-operation skills. The Colleges should concentrate on the generic and the general.

For Camco, the school system needs to deliver on the 3Rs, communication skills, the ability to work in groups, and a congenial value system.

2. **The Colleges in their technology and other vocational training activities should concentrate on giving a good grounding in applied generic skills. The application and firm-specific training should be left to individual firms.**

The over-specialization in delivery by Colleges in the past will not serve the future Ontario economy well.

In the view of Camco management, it may be impossible for the Colleges to train to specific firm requirements because within the institutions there are too many competing demands. The colleges should give generic technical skills training. Employers can enhance these with specific applications, techniques and procedures related to their businesses.

For Honeywell management, Tool Design can only be adequately learned with five to ten years' experience in the workplace dealing with mould and die design. However, they need basic CAD/CAM fundamentals beforehand. These fundamentals and intermediate computer literacy can be built upon by the firm in further training.

3. **Colleges may co-operate in delivering short-burst, customized training in co-operation with local industry for both general upgrading and specific applications.**

In the case of Lasco, they are using Durham College for courses for their foremen. They receive fundamental skills related to a general knowledge of metallurgy, analytical, and communications skills. This is aimed at the facilitator role that foremen are expected to assume in the future. Lasco has also sent about 40-50 hourly employees to the training at the College, expecting that future supervisors may be drawn from this group. They receive training in interactive management, SPC, and quality enhancement. Lasco designed the course, and the College delivers it.

4. **In spite of the general patterns of upskilling, industrial restructuring will also have a labour adjustment downside effecting specific localities, occupations, and industries. The role of the College in these cases should be the enhancement of the portable fundamental skills and generic applied skills that these workers will need to be re-employed.**

Finally, the interviews were conducted with large firms, that is, Camco-GE, Honeywell-Bull, Co-Steel International, and Stelco. Management representatives from these firms believe that smaller firms are more dependent on the colleges. For instance, smaller firms can't develop their own SPC applications training. A large firm can develop training modules internally or contract with an outside, private, training delivery agency. The process is then extended because larger organizations are better able to buy people off the street with the skills they can then enhance.

It is a recognized fact that more formal training of employees is done by large organizations than by small businesses. It is sometimes countered that small businesses do a considerable amount of informal 'training.' However, the same claim is traditionally made by large firms as well. The practice of relying on informal training (often called 'following Joe around') is of questionable value for enhancing the productive performance of businesses facing the challenges of the 1990s.[12] Instead, it is arguable that in fact small businesses have even more to gain from an educational system that delivers high quality fundamental and generic technical skills. Given the scarcity of their internal resources, small businesses may be even more dependent on the public educational sectors delivering for them in the 1990s.

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[12] See *Made in America*. Report of the MIT Commission on Industrial Productivity, MIT Press: Cambridge 1989, 81093.

Appendix A

1. Do you distinguish between fundamental skills versus applied or firm specific skills?

2. What are the kinds of background skills that firms need for their employees to have in order to train them, for example, literacy, problem-solving, analytical skills? Can you give some actual examples?

3. What is the role of the community college or university versus the private sector or firm in training?

4. What is literacy? Do even people with very basic jobs require basic chemical listing, calculation, reading labels, charts, etc. to do their current jobs?

5. To what extent are firms going to supply their needs through drawing on their existing workforce or internal labour market, and to what extent do they expect high school, community college, or university graduates to supply their needs?

6. Does it make sense to separate the following types of training:

   a. New entrants.
   b. People currently employed or facing displacement
   c. People who are currently employed but who need retraining to keep their skills up to date?
   d. Those who are employment disadvantaged.

7. Does it make sense to distinguish between the following types of skills and training:

   a. Basic entry-level or fundamental skills.
   b. Short burst training to meet specific employer needs.
   c. General technology literacy

8. Should delivery of the above be done by different institutions at different levels, for example, community colleges, firms, or other private agencies?

9. What are you looking for from the community colleges?

10. How are the needs and capabilities different between large and small businesses? Are the smaller businesses more dependent, and do they expect more from the colleges?

Colleges
and the
Changing Economy

Background Papers

Sandford Borins
Professor of Management
Administrative Studies
York University

and

Shirley Holloway
Dean of School of Technology and Science
George Brown College

Meeting the Competitive Challenge: Enhancing Applied Research in Ontario's Colleges

Study Team 2

Meeting the Competitive Challenge:
Enhancing Applied Research in Ontario's Colleges

Summary

It has become increasingly obvious that governments throughout the world must rethink their economic policies in order to compete successfully in the new global economy because the rapid development of information and communications technology has transformed the marketplace. The key factors in a successful economy are the abilities to develop new technology and to apply it to create new products and processes. This requires a high level of research and development; a literate, well educated workforce; and increasing cooperative initiatives between government, business, and labour. This paper examines some aspects of the role which community colleges can play in the creation of a Canadian society able to maintain a high standard of living in the competitive global economy. More specifically, it argues that applied research should be a part of the community colleges' mandate. The two major reasons are that this would improve the pedagogical capabilities of the colleges, and that it would enable the colleges to contribute their expertise in responding to the need to improve Canada's performance in research and development.

The focus group discussions carried out by the Vision 2000 Study Team 2 made it clear that business interests are concerned that faculty members remain current in their fields so that students will receive appropriate, leading edge instruction. The general consensus is that active participation in research and development would support the quality of the institution's teaching.

The concept of carrying out applied research in the colleges is not new, and an examination of initiatives already undertaken shows that there is a proven record of success. Most of the instances cited exemplify a high degree of cooperation between colleges and businesses or other agencies and/or consortia which ally universities with colleges and business. A wide range of interests are covered by these partnerships and they are most often built on the foundation of local economic interests and the expertise of staff members in the educational institution. The outcomes of such applied research have ranged through the development of new products or processes, resulting in increased local employment opportunities, new delivery methods for established curricula, introduction of leading edge technology into the curriculum, establishment of new businesses, and help to existing companies in adjusting the capabilities of their labour forces to meet new demands. Some applied research undertaken by colleges has aided the entry of non-traditional students into the formal educational setting, and one case is cited of work which has led to improved educational possibilities for the disabled.

An examination of a recent survey of faculty members at Ontario colleges by Stephen Bell shows that many faculty in community colleges are already engaged in some form of applied research, and it is clear that there is an appetite to continue to expand this interest.

Although community college faculty are constrained to some extent by the limitations of their contracts and also by funding availability, the authors present recommendations that would enable research to be carried out within the current system on a cost-effective basis. Central to these recommendations is the establishment of an Office of Applied Research within the Ontario College System. This office would have a number of tasks, including the development of a registry of faculty and staff willing and qualified to carry out research; establishment of an information and assistance program for faculty and staff wishing to gain access to funding for research; administration of a research fund to support a small program of grants for faculty and staff; seeking partners from the business, labour, government and non-profit sectors for collaboration in college-based research activities; and development of an applied research agenda for the entire college system.

The proposals do not detract from the primary function of the colleges, which is teaching, and do not overlap with the kinds of research properly carried out within the university setting. They do provide support for applied research because it will improve morale and job satisfaction within the colleges and ultimately increase the quality and relevance of instruction at the colleges, as well as provide social and economic benefits to the community.

Prendre le pas sur la concurrence en misant sur las recherche appliquée dans les collèges de l'Ontario

Sommaire

Vu la transformation qu'opère sur le marché mondial l'accélération constante du progrès des technologies d'information et de communication, la nécessité pour les gouvernements du monde entier de revoir leurs politiques économiques pour rester concurrentiels est de plus en plus évidente. Les facteurs clef d'une économie prospère sont l'aptitude d'inventer des technologies nouvelles et l'application de celles-ci à la création de produits et de procédés nouveaux. Pour cela, il faut multiplier les activités de recherche et développement, posséder une main-d'œuvre instruite et cultivée et favoriser la coopération entre les pouvoirs publics, le monde des affaires et le milieu syndical. Ce document examine certains aspects du rôle que peuvent jouer les collèges communautaires dans la création d'une société canadienne capable de préserver un niveau de vie élevé dans une économie globale compétitive. Il prône plus précisément l'intégration de la recherche appliquée au mandat des collèges communautaires. Les deux arguments principaux à l'appui de cette thèse sont que pareille intégration rehausserait les capacités pédagogiques des collèges et mettrait à profit leur expertise dans le redoublement des efforts que le Canada doit fournir en matière de recherche et de développement.

Il ressort des discussions de l'équipe de travail 2 de Vision 2000 que les industriels accordent beaucoup d'importance à ce que les membres du corps professoral restent au fait de l'évolution de leurs domaines de spécialisation pour assurer à leurs étudiants une instruction valable, à la pointe du progrès. Le consensus général est que la participation active à la recherche et au développement menés par un établissement viendrait renforcer la qualité de l'enseignement qui y est dispensé.

La notion de recherche appliquée dans les collèges ne date pas d'aujourd'hui et les initiatives entreprises jusqu'ici se sont soldées par un succès. La plupart des exemples cités illustrent une coopération étroite entre les collèges, les entreprises et les autres organismes ou consortiums qui servent d'intermédiaire entre les universités, les collèges et le monde des affaires. Ces associations, qui représentent des intérêts très divers, sont le plus souvent basées sur les priorités économiques locales et les compétences du personnel des établissements d'enseignement. Cette recherche appliquée a abouti à la création de nombreux procédés et produits nouveaux, multiplié les possibilités d'emploi locales, renouvelé les méthodes pédagogiques appliquées aux cours existants, incorporé les programmes de technologies avancées, créé de nouvelles entreprises et aidé les sociétés établies à adapter les aptitudes de leurs employés aux exigences des temps modernes. Certains travaux de recherche appliquée effectués par les collèges ont permis de faire admettre des étudiants ayant des besoins spéciaux à des établissements d'enseignement traditionnels : un cas particulier a abouti à l'expansion des voies d'études ouvertes aux étudiants handicapés.

L'examen d'un récent sondage mené par Stephen Bell auprès d'enseignants de collèges ontariens montre que bon nombre d'entre eux participent déjà, d'une manière ou d'une autre, à la recherche appliquée et qu'ils ne demandent pas mieux que d'en faire davantage.

Les enseignants des collèges communautaires sont soumis à certaines limitations contractuelles et financières; toutefois, les auteurs formulent des recommandations selon lesquelles la recherche pourrait se faire, de manière rentable, au sein du système actuel. La principale recommandation porte sur la mise en place d'un Office de la recherche appliquée œuvrant pour l'ensemble des collèges de la province. Cet office aurait notamment pour mission d'établir un registre du personnel (enseignant et autre) disposé à faire des recherches et possédant les compétences nécessaires, d'instaurer un programme d'information et d'assistance pour le personnel intéressé à obtenir des subventions de recherche, d'administrer un fonds destiné à alimenter des subventions restreintes pour le personnel, de trouver, dans le monde des affaires, le milieu

syndical, les pouvoirs publics et les organismes à but non lucratif, des partenaires pour la recherche menée dans les collèges et, enfin, d'établir un programme pour l'ensemble des collèges en matière de recherche appliquée.

Ces propositions ne vont pas à l'encontre de la fonction primordiale des collèges, qui est d'enseigner, et leur mise à exécution n'empièterait pas sur le type de recherche effectuée, à bon escient, au sein du système universitaire. Elles vantent les mérites de la recherche appliquée, parce qu'elle améliorerait le moral et la satisfaction professionnelle dans les collèges, renforcerait la qualité et la pertinence de l'enseignement qui y est dispensé et qu'elle aurait des retombées socio-économiques intéressantes pour les collectivités.

Table of Contents

Page

Introduction 1

The Role of the Colleges 2

Applied Research Initiatives in the College System 4

The Role of Faculty in Applied Research 7

- Community College Faculty 8
- The University 8
- Ryerson Polytechnical Institute 9
- Funding Sources 9
- Students in Research 10

A Survey of College Faculty Involvement In, and Attitudes Toward, Applied Research 10

- The Survey and the Sample 10
- The "Sub-Rosa" Applied Research and Professional Activity Culture 11
- Measures of Job Satisfaction 14
- Conclusion 15

Enhancing Applied Research in the Ontario College System 15

- 1. Reduce Faculty Teaching Loads 15
- 2.. An Office of Applied Research in the Ontario College System 16

Appendix 19

Introduction

The world is currently undergoing a major economic transformation. The major factor driving this process is the rapid development of information and communications technology. Information technology has had a dramatic impact on the way work is done in both offices and factories. New technology has improved the flow of information within the firm, thereby thinning the ranks of middle managers whose function is primarily to serve as conduits of information. This technology, incorporated into robots and CAD/CAM, has led to increased flexibility in production, greater customization, higher quality, yet lower costs.[1] The incorporation of microprocessors into many products has greatly increased their capabilities, and hence the satisfaction provided to the consumer. Enhanced communications technology has led to a globalization of markets, in particular in the financial sector.

A key concern of governments throughout the world is the set of policies that will help a nation to survive and prosper in the new international economy. The new formula for enhancing the wealth of a nation is very different from the classical economic theory of comparative advantage. In the past, nations did well by building on their natural endowments, such as land, climate, resources, or location. The new global economy is much more footloose, and natural resources are much less important. For example, the major raw material in the computer chip is silicon, found in abundance everywhere. Production can be located almost anywhere. The key factor of production has become intelligence — the ability to develop new technology and apply it in the creation of new products and processes. The theory of static comparative advantage has been replaced by a theory of dynamic comparative advantage, in which nations create comparative advantage in various industries through the application of their intelligence in new technology.

The new formula for national success in the global economy has a number of components, which have been very well identified in the reports of the Premier's Council.[2] It includes:

- A high level of research and development;
- A literate, well-educated, highly-skilled, and flexible workforce;
- A broad consensus among government, business, and labour that can serve as a framework for initiatives to move resources out of declining and into advancing sectors of the economy or initiatives involving cooperation among firms (industrial policy).

In terms of this formula, there is great cause for concern about Canada's prospects. Canada is currently devoting less than 1.5% of its GNP to research and development, a level roughly comparable to such countries as Australia, Spain, Greece, and Portugal, and far behind the U.S. and Japan, which are spending close to 3% of GNP on research and development, and West Germany, Sweden, Switzerland, the U.K., and France, all of which are spending roughly 2.5%. The President of the National Sciences and Engineering Research Council recently warned that, if research and development spending is not increased, Canada "will slip quietly out of the group of countries called the developed world."[3] Other indicators of technological performance, such as industry-funded and higher education research and development expenditures, patents per capita, international ownership of technology, research scientists and engineers as a percentage of the labour force, the trade balance in high technology, and the diffusion of technologies such as robotics, are equally poor.[4]

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[1] See C. J. McMillan, "The Automation Triangle: New Paths to Productivity Performance," *The Business Quarterly*, Fall, 1987.

[2] Ontario Premier's Council, *Competing in the New Global Economy*, Vol. 1, 1988, and Vol. 3, *Industrial Policy Studies*, 1989.

[3] Patricia Lush, "R and D is Near Third-World Level: NSERC chief," *The Globe and Mail*, Oct. 24, 1988.

The second key success factor is also a cause for concern. A recent study prepared for the Southam News Organization found that 24% of the Canadian workforce was functionally or marginally illiterate.[5] Studies like this, in both Canada and the United States, have led to a serious questioning of the performance of our training and education systems. Thus, the Premier's Council has chosen the German use of apprenticeship as an integral part of education, the Japanese practice of lifelong education for the workforce, and Sweden's retraining policy, which is part of its industrial restructuring policy, as possible models for training policies in Ontario.[6] For example, one particularly impressive aspect of Japan's economic performance is the concept of the "factory as laboratory," in which all employees are encouraged to make suggestions to improve efficiency. Indeed, the number of suggestions made and the percentage implemented are both impressively high.

The third success factor, broad agreement among government, business, and labour about the framework for industrial policy, is one where Canada has had great difficulty reaching consensus. The federal government's inability to develop an industrial strategy over the last twenty years has been chronicled by authors such as Richard French and Jim Gillies, and the difficulties that have been incurred in establishing the Department of Industry, Science, and Technology are well known.[7] The establishment of the Ontario Premier's Council, and the rapid establishment of similar councils in all the other provinces, can be regarded as attempts by the provinces to do on their own what has not been possible on a national level. The Ontario Premier's Council report also discusses quite frankly the failures of Canadian industrial policies in terms of their lack of competitive analysis, their short-term ad hoc nature, their inadequate focus on points of leverage, and the poor linkage among policies.[8]

The Role of the Colleges

In order to maintain Canada's competitiveness in the new global economy, it is clear that a variety of policies are required. The colleges must be part of the solution. Given their mandate, the colleges' main role will be in the creation of a literate, well educated, highly skilled workforce. Two other authors in this volume, Wolfe and Mahon, have discussed the nature of education the colleges should provide, in particular focusing on generic literacy and numeracy skills, as distinct from job-specific skills.

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[4] See the tables in Ontario Premier's Council, Vol. 3, *Industrial Policy Studies*, Appendix D, pp. 185-195; and C.J. McMillan, *Investing in Tomorrow: Japan's Science and Technology Organization and Strategies*, (Ottawa: Canada Japan Trade Council, 1989).

[5] See McMillan, *Investing in Tomorrow*, pp. 56-59, 95.

[6] Ontario Premier's Council, Vol. 3, *Industrial Policy Studies*, Chapter 6, "Comparative Training Strategies", pp. 121-149.

[7] See Richard French, *How Ottawa Decides* (Toronto: Lorimer 1980); James Gillies, *Facing Reality: Consultation, Consensus, and Making Economic Policy for the Twenty-First Century* (Montreal; Institute for Research on Public Policy, 1986); John Kohut, "Ottawa Struggling to find appropriate strategy for R and D," *The Globe and Mail*, Jan. 6, 1988, p. B10; McMillan, *Investing in Tomorrow*, pp. 60-61.

[8] See Ontario Premier's Council, Vol. 3, *Industrial Policy Studies*, Chapter 1, "Ingredients of Good Industrial Policy", pp. 9-22.

The thesis of this paper is different, but supportive of their work. Our argument is that applied research should be part of the colleges' mandate for two major reasons. First, it improves the pedagogical capabilities of the colleges. Second, it would enable the colleges to contribute their expertise in responding to the first competitive challenge; namely, the need to improve Canada's performance in research and development.

Before discussing the arguments, a definition of applied research is in order. The Premier's Council has distinguished between basic or pre-competitive research, which it defines as "research aimed primarily at discovery rather than product development" and applied research, which is " [the] transfer [of] this scientific knowledge into industrial and commercial applications."[9] Basic research involves the discovery of new scientific principles, while applied research involves the application of principles to solve existing problems and develop new products. For example, basic research in mathematics could lead to the development of new computers. Basic research in biology could lead to the development of new medicines.

We make no claims that the colleges should be involved in basic research. That is, quite rightly, the responsibility of the universities, government, and a very small number of major corporations that are willing to support it. However, there are a number of strong reasons why the colleges should be involved in applied research, in particular if it is done in cooperation with the organizations for which colleges are training students.

First, intellectual renewal of faculty is essential to effective pedagogy. Both the Japanese and many major North American corporations invest heavily in lifelong training of their workforce in order for them to stay abreast of new technologies and to develop new skills.[10] If it is necessary for workers continuously to retrain, then it is equally necessary for those who train workers to continuously update their knowledge so that the education they are delivering is up-to-date. An instructor who is spending every working hour in the classroom has no time for renewal. In a world of rapid technological change, his/her knowledge will soon become dated and his/her instruction ineffective.

Study Team 2 conducted a number of focus group consultations on the role of the colleges in the changing economy, and this theme was repeated frequently.[11] The manufacturing sector focus group felt that "college teachers are often out of touch with the reality of the workplace, and two-way staff exchanges with industry should be frequent and regular as greater in-depth understanding is needed." The focus group on information and communications technologies felt that "the college instructors are not keeping up with the pace of change — they must take periods in the workplace, through sabbaticals or exchanges, and be committed to lifelong learning for themselves. The large employers are interested in developing such relationships — and looking at joint ventures and partnering as well — to work together with the colleges and their faculty." The focus group from industry associations wanted closer links established between business and the colleges. The financial sector group felt that "the teachers who have real business experience are producing far more valuable graduates — the teachers must be kept up to date and take time in business." The hospitality sector group felt teachers in their area should get work experience in order to stay up to date. The northern region/resource sector group were also concerned about "teachers and counsellors who don't know the processes and circumstances of industry" and were, therefore, interested in staff exchanges. Finally, a Francophone business group referred to the role of Quebec CEGEPs in applied research and offering assistance to regional development plans. Thus, "participants saw no reason why

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[9] See Ontario Premier's Council, Vol. 3, *Industrial Policy Studies*, p. 103.

[10] See Ontario Premier's Council, Vol. 3, *Industrial Policy Studies*, p.125, mentions the training activities of General Motors, IBM, McDonnell Douglas Canada, and the major Canadian banks.

[11] Audrey Gill, "Role of Colleges in the Changing Economy—Report on Consultations," July 1989.

[Ontario] colleges should not engage in joint research efforts with local businesses as part of an overall strategy to promote community development."

The second major reason for college participation in applied research is because improving Canada's technological performance is a necessity for our economic survival and the colleges have something to contribute. The colleges' contribution can come about in a number of ways. They have a number of areas of expertise, in particular concerning the occupations for which they are training people. In addition, as discussed below, the educational attainments and capabilities of college faculty have increased substantially in recent years. As the Japanese have shown, major productivity increases come about through the integration of office and factory and the involvement of all workers in "the factory as laboratory." The best way to prepare workers for a "factory as laboratory" environment is in a "college as laboratory" environment. The Science Council, in its recent report on university-industry interaction, urged universities to emulate the colleges in forging closer links with industry. The report also saw collaborative research projects between colleges and industry as the logical consequence of these closer ties.[12]

Finally, as will be discussed below, increasing the involvement of the colleges in applied research is likely to improve prestige and morale for the colleges, which will make them more effective institutions.

The following sections of this chapter will expand in various ways on this argument for an increased role for the colleges in applied research. First, we examine various applied research initiatives undertaken by colleges, both in Canada and elsewhere. We then examine the incentive system affecting faculty at Ontario colleges, and compare it with the incentive system at the universities. This is followed with a report on a survey of the involvement in and attitudes towards applied research activity on the part of faculty at Ontario colleges. We conclude by recommending the establishment of an Office of Applied Research for the Ontario college system, and discuss the role it would play.

Applied Research Initiatives in the College System

Partnerships between community colleges, business, industry, and various social and health care agencies are well established. All college programs focus on the training needs of the community, and extensive use is made of program advisory committees made up of representatives of local industry and other employers. For the most part, this structure has concentrated on curriculum needs rather than on the benefits of mutual involvement in applied research. However, there have been a number of successful ventures involving cooperation between colleges, universities and the business community in Canada in applied research ventures.

One such example is the consortium of 18 businesses and 4 post-secondary institutions (Carleton University, University of Ottawa, Algonquin College, and University of Quebec at Hull) known as the Ottawa-Carleton Research Institute (OCRI). Its mission is "to enhance research and development activity between industry and the participating universities and colleges, thus contributing to a world class technology infrastructure within the Ottawa-Carleton region for the benefit of Canada." OCRI focuses on micro-electronics, communications, computer technologies, and (potentially) biotechnology. UQAH is a small university, comparable in size to many community colleges (118 faculty, 5,000 students), but its Applied Science Research Team is contributing to the consortium's activities by developing software packages designed to help secondary school and college students in science studies. Some of these applications are suitable for use in industry training.

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[12] Science Council of Canada Report Number 39, *Winning in a World Economy: University-Industry Interaction and Economic Renewal in Canada*, (Ottawa: Supply and Services Canada, 1988).

There are a number of other such college programs in applied research and development in Ontario. Algonquin College personnel are currently involved in two university research and development activities in real time computing, microelectronics, and manufacturing technologies. These faculty have access to the consortium's facilities, underlining the fact that individual colleges do not necessarily have to invest in extra expensive equipment in order to participate in high quality research.

Fleming College has recently established a Centre for Manufacturing Studies which offers a range of service to industry in four key areas: corporate and market development, executive development, information, and training. Corporate and market development services include an assessment service to help determine the strengths, weaknesses, and capabilities of a manufacturing business, and also help identify new products and market opportunities to achieve maximum use of existing equipment. Information services provides searches for manufacturers seeking information on business, economic, and technical questions covering all aspects of current manufacturing management. It should be noted, however, that this centre is separated from the teaching units of the college and employs a separate staff.

Another example of cooperation among industry, universities, and colleges can be seen in one of the province's Centres of Excellence, the Institute for Space and Terrestrial Science (ISTS), based at York University, and within which Humber College is one of the partner institutions. Humber's role in ISTS is to supply students trained in its technology program who can work as laboratory and research technologists at the various ISTS labs. This summer two final year electronics students are working in the electro-optics lab, but the potential, as ISTS grows, is much greater. George MacFarlane, Director of ISTS, sees the probability of up to 12 research technologist positions in the university based labs and, if a cooperative program is established, between 30 and 50 such positions in industry. In order to support a program of this magnitude, Humber College would have to develop a new course on scientific instrumentation. The role of scientific research technologist would provide a challenging career path for college graduates. Such people would be responsible for customizing, installing, calibrating, and maintaining scientific equipment, as well as assisting in the experiments and data analysis being done in the laboratory. By and large, this sort of role is not attractive to graduate students in the sciences, whose main concern is completing their dissertations.

The career prospects for a research technologist will depend on how much initiative the individual is willing to take and how much challenge and responsibility the principal investigator is willing to provide. A good research technologist could become invaluable in the overall management of the laboratory. In addition, he or she might supplement his/her college degree with part-time courses towards a bachelors degree in engineering. Such a person would become known in the scientific community as an effective laboratory manager and thus would have an independent career which is not tied to any one particular lab. As an indication of the sort of earnings which are possible, ISTS currently pays between $22,500 and $28,500 for a laboratory technologist with a one-year diploma, and between $25,000 and $35,500 for a technologist with a three-year diploma, six years' experience, and responsibility for supervising junior technical staff.

Sheridan College has a Research and Development unit which was set up to develop new curricula, teaching resources, products and processes. Its activities have been particularly strong in the field of computer innovations which have had significant impact in a number of areas. For example, one project undertaken with the cooperation of Pro-Line Software of Mississauga resulted in the development of a new computer software package of significant benefit to the disabled.

The initiatives outlined above have utilized the cooperation of local businesses and industry, but it must be recognized that applied research takes many forms. There have been many fruitful research projects undertaken by community college faculty which have focused on community social needs. At George Brown College, studies have been carried out on the educational needs of both the multicultural community and the growing senior citizens' communities.[13] These studies have resulted in significant actions being taken by the college in serving these groups. In a joint project, Centennial, George Brown, Humber, and Seneca Colleges annually survey the training needs for selected occupations in the Metro Toronto and York regions.[14] This survey relies heavily on the cooperation of local firms and has had funding support from the Canada Employment and Immigration Commission. The survey results are used in predicting and establishing the kinds of training programs needed to meet local business needs. A wide range of opportunities exists for similar needs assessments for other groups and for studies on alternative curricula and delivery methods in college outreach programming.

Other provinces have also established research programs in their community colleges. The Automated Production Centre (APC) is part of the Cegep de Jonquière, offering its services exclusively to business, and it includes applied research amongst its objectives. One of its many achievements is the development of automated control of a special saw for paper rolls which is manufactured locally and sold widely in Canada and abroad. At the Cegep de La Pocatière, the Applied Physics Centre cooperates with private industry (primarily small businesses) in the development of high tech products and automation of production processes. For example, it has been instrumental in the development of fibre-optics modules which have been exclusively marketed, and which have provided employment opportunities to the local community. In Alberta, The Northern Alberta Institute of Technology (NAIT) has a Centre for Entrepreneurship and Independent Business which includes Applied Research/Joint Venture amongst its units. An interesting development was the formation of a partnership between NAIT, the University of Sussex (in England), and Teletronic Communications Ltd. Under their joint agreement, NAIT sent a faculty member to Sussex to carry out research to develop the theory and computer software for the design of an optimally realizable data transmission filter. The NAIT facility carried out the testing of components of the integrated video and data multiplex system, which Teletronic was able to develop on the basis of the Sussex research. In addition to the obvious business advantages, this project also led to staff development initiatives at NAIT which resulted in leading edge technologies being incorporated into student programs.

In the United States, partnerships between businesses and universities are more common than between community colleges and business, but there are notable exceptions. One example of the latter is the Emerging Technologies Consortium (the community colleges of Lansing, Macomb County, Oakland, and Wayne County) which has examined changes in the workplace resulting from the introduction of seven technologies: office automation, telecommunications, computer aided design (CAD), laser applications, quality control, materials management, and computer assisted manufacturing (CAM).[15] Information gathered is used to tailor curricula to the needs of businesses and industry in Southeastern and Central Michigan. This type of research needs little in the way of capital investment yet provides a needed service to business.

The Illinois Research Network (IRN) is a statewide electronic directory of faculty resources. This can identify faculty at seven Illinois universities who have the expertise to meet particular needs of business, government, and education across the nation. A glossary of 6,500 subject terms helps to identify people with needed talents from among thousands of profiles on line. Eight IRN search officers help locate talent to consult on special projects, conduct research and development, speak at conferences, develop proposals, identify testing facilities in laboratories, conduct employee training and in-service seminars, provide expert testimony, evaluate applications of new technologies, provide technical assistance and conduct community programs. Although the IRN specifically targets university faculty, there is no reason why a similar network could not be set up utilizing community college faculty interested in such tasks.

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[13] Hynes, M., *Access to Potential: A Two-Way Street*, George Brown College, Toronto, July, 1987, and Rudin, S., *The Educational Needs and Interests of Senior Citizens in Metropolitan Toronto*, George Brown College, 1987.

[14] *Skills in Shortage 1989*, A survey of Selected Occupations in Metro Toronto, the Fifth Annual Report of the Metropolitan Toronto and York Region Labour Market and Training Needs Assessment, May, 1989.

[15] Ammon, A., and Robertson, L., "Emerging Technologies in the Workplace," *A.A.C.J.C. Journal*, March, 1985, p. 22-27.

The Ohio Technology Transfer Organization (OTT), started in 1978, commits Ohio's two- and four-year colleges to provide technological assistance in their service regions through a network of 34 agents located across the state. Information provided often is related to new technologies, materials, equipment, and management methods. Linking the network through Ohio State University enables a broad based pool of talent to be tapped.

Small business training and research centres such as the Centre for Entrepreneurship and Small Business Management (Wichita State University) and the Centre for Entrepreneurial Studies and Development Inc., (West Virginia University) not only advise owners of established businesses but also help people with marketable ideas develop plans for founding new businesses, including information about how to get venture capital, how to build management teams, and how to deal with problems of production and marketing.

To summarize this section, there have already been many fruitful collaborative enterprises involving colleges, government, business, and labour in developing, updating, and maintaining training programs, as well as in other applied research appropriate to regional needs (see Table 1 in Appendix). Colleges are fortunate in having many faculty with good academic backgrounds, coupled with expertise in specific business or industrial fields. Many of the colleges' facilities are modelled on business patterns, and often the graduates of the programs go on to participate in applied research. What is needed is to extend these existing partnerships and to identify the most fruitful types of research possible.

The Role of Faculty in Applied Research

Post-secondary institutions in general have been seen to be associated with three types of activity: teaching, research, and service. In universities, each of these has traditionally relied on different administrative structures for effective implementation. Academic departments are responsible for teaching, but funded research has depended primarily on individual faculty members, who set up their own research groups, and who must apply for their own research funding from various sources. Service activities are often centrally coordinated and may operate through continuing education centres. As in the case of research, individual faculty members, acting entrepreneurially, may be involved in service activities. Teaching, research, and service are interrelated and mutually reinforcing, but they may be performed by different people, operating within overlapping yet competing structures. Most university faculty have their primary affiliation with either an academic department, a research institute, or a unit that provides community service. In community colleges, faculty are primarily occupied with teaching and have integrated service or research activities with this primary function. With a few exceptions, such as those outlined in the previous section, colleges have not set up independent research or service agencies, although typically a small unit would be occupied with gathering internal statistics. The research which has been carried out by faculty has concentrated primarily on issues relating to the programs in which they teach. The requirements of any institution in teaching, research, and service functions are quite different, and there are three possible models for allocating work to faculty in order to make best use of their time and talents. These are:

- Primary attention to teaching, secondary to service, little research;

- Focus on teaching ,and particular emphasis on general education and a distinctive model of scholarship;[16]
- Emphasis on research, with only secondary emphasis on teaching and service.

Client groups of the institutions vary widely and influence the role which the faculty member is called upon to play and also the technologies employed in the teaching function. Institutions that have an open door policy (such as community colleges) may give considerable attention to devising better technologies for remedial education whereas this is not an issue at more selective ones. People applying the technologies at the various institutions differ in terms of their preparation, skills, and career expectations.

Community College Faculty

The mandate of the community colleges has been to provide business, industrial, and vocational training to graduates of Ontario's secondary schools or to adults who are upgrading their skills or preparing for a career change. Students in post-secondary programs are expected to have a minimum of grade 12 (or equivalent), though many exceed this requirement. Faculty who joined the community college system, especially in its early days, were often secondary school teachers or journeypersons in a recognized trade. As time went on, the system attracted more instructors with bachelor's degrees and then with higher degrees or other post-graduate qualifications. These instructors are often extremely interested in continuing on with some form of research as well as teaching.

Faculty belong to the Ontario Public Service Employees' Union (OPSEU), and contracts are negotiated between the union and the 22 colleges on a centralized basis. Under the terms of the current contract, instructors in post-secondary (that is, not apprenticeship or government sponsored retraining programs) teach for 36 weeks of the year and have maximum teaching load per week of 18 hours. There is a formula for calculating credit for such activities as course preparation and student evaluation, such that the total calculated workload may not exceed 44 hours. The terms of employment do not include any requirement for research or the writing of books or articles, though many faculty do some original writing of various kinds. Because of the workload situation, it would be unusual to find a faculty member with time to do any significant amount of research during the teaching year. Each member is allowed 10 days of professional development leave per year, usually used for attendance at conferences or refresher visits to business or industry, and there is provision for paid sabbatical leaves.

Some faculty have taken advantage of a scheme which allows them to draw a smaller fraction of their salary over a period of 3 to 6 years and then take a year off with no obligation to the college to report on their activities. Whilst some faculty treat this as an extended holiday, many have used such time for work on a higher degree, a return to industry to obtain some up-to-date experience, or for writing a textbook. Some work on higher degrees requires research, both of the library and "bench" types.

Tenure is gained after two years of satisfactory teaching performance and there is thereafter an automatic progression up the salary scale each year to an established maximum. There are no distinctions in rank between faculty members, and there are no formal rewards for non-teaching activities.

The University

The mandate of the university has really not changed in centuries. This has been to provide post-secondary education of high quality (not specifically job-related); to provide intellectual and academic leadership to the community; and to foster original research (not necessarily applied) in order to extend the frontiers of human knowledge.

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[16] Ruscio, K. P., "The Distinctive Scholarship of the Selective Liberal Arts College," *Journal of Higher Educations*, 1987, 58:205-222.

In recognition of this mandate, it is not usually expected that faculty engage in teaching on a full-time basis. Faculty are normally expected to have gained a doctoral degree, together with post-doctoral research experience or other creative, non-teaching activity, before appointment.

Tenure and advancement in the system requires that a significant amount of research or other creative activity be carried out. For this purpose, many faculty assemble a group of research students and post-doctoral fellows and must spend a good deal of time in applying for research grants from such bodies as the National Research Council. In most cases, teaching is carried out only during two semesters, and there is a good deal of research carried out in the third part of the year.

Ryerson Polytechnical Institute

Ryerson occupies a unique place in the Ontario education system. Although it is a degree-granting university, the teaching workloads of faculty are somewhat similar to those of community college teachers. This workload usually includes 10 to 16 hours in class per week, with a maximum attributed workload (using a formula to calculate time needed for preparation, student interviews, evaluation, etc.) of 50 hours per week. Concern has been expressed at the lack of time for research, and a study is being carried out to evaluate this problem. The final results of this study may prove useful to community colleges who have similar problems. The study team, the Joint Committee on Workload, has a statement of mission which is: "To consider and recommend patterns of teaching and other academic work acceptable to faculty and the Board and more appropriate to Ryerson's role in the university system."

The investigators[17] have considered workloads in the various faculties and departments, as well as faculty and administrative attitudes towards the possibilities for research and to their general responsibilities. In addition, a comparison was made between practices at other universities and at Ryerson. Ryerson faculty are similar to those in community colleges in that they felt that their primary concern should be for the students and for professional competence. Chairs and Directors expressed hopes that more time would be made available for non-teaching activities; 12 of 32 departments or programs cited research as a preferred activity and 10 cited applied research.

The investigators found that university workloads are smaller but are combined with more forceful (and potentially enforced) expectations for outside professional activity. This enforcement system is integrated with faculty tenure requirements, progression through the ranks, associated salary ranges, and other items of merit. Implied in many faculty/university agreements is the assumption that the faculty member is a scholar or practitioner who wants to do research, consulting, or creative work, and that, in exchange for the teaching role, he or she will have time to do that non-teaching work. Not only will time be provided but, to the extent possible, facilities and funds will be available.

Funding Sources

As mentioned above, university faculty have access to funds from government agencies, though there is widespread dissatisfaction with the amount of money released for pure research in Canada and with the cumbersome methods which must be used to obtain them. This type of funding has never been available to community college faculty who might wish to carry out research.

The alternative source of funding for both groups is business or industry. Applied research is now becoming more fashionable in university circles, especially in such disciplines as engineering. This is certainly true in European countries. As one example, the University of Stuttgart has some enviable research facilities in mechanical and civil engineering which are funded heavily by industry.

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[17] "Developing Workload Options for the Nineties," Interim Report and Working Paper, Research Funding, Ryerson, December, 1988.

Students in Research

In universities, students are expected to carry out research both at the undergraduate and post-graduate levels. This research is usually of high calibre and students frequently have access to extremely sophisticated equipment and extensive library holdings. Community college students often are required to complete a research project in their final year but generally have less opportunity to use state-of-the-art equipment and the library system is not supportive of research.

Recently, Humber College and Ryerson Polytechnic have entered into an agreement by which Humber students work with Ryerson faculty on research projects during the summer months. The students thereby gain valuable experience in research techniques, equipment access and improve their chances of gaining employment in a research facility. Ryerson faculty profit from additional help during their limited research time. It would appear that more such ventures should be possible.

A Survey of College Faculty Involvement in, and Attitudes Toward, Applied Research

The previous section has discussed the disincentives, based on both collective agreements and college mandates, to college faculty members to do applied research. Recently, a survey of college faculty activity in and attitudes towards applied research was undertaken. If the result of such a survey were that college faculty have not been involved in any applied research activity, and have no desire to become involved, then the most likely conclusion to draw is that it will be very hard to stimulate such activity. It would suggest that, despite all the theoretical benefits of increased applied research at the colleges, such an objective would be very hard to implement. On the other hand, were there evidence of some applied research activity at the current time and a broad desire to do more, then the chances of implementing a policy of stimulating applied research would be increased. What do the data say?

The Survey and the Sample

A random sample was taken of faculty members; that is, teaching masters employed full-time in post-secondary programs at 7 of Ontario's 22 colleges. The sample was designed to include colleges in all of the province's major geographic regions delivering the full variety of programs. The sample was self-weighting as 25% of the faculty in each college were selected. The final sample included 394 people out of 865 sampled, a response rate of 46%. The sample was 57.5% male and 42.5% female; 10% were between the ages of 25 and 34; 52% between the ages of 35 and 49; and 37% between 50 and 64. Nineteen percent of the faculty taught in business programs; 26% in technology programs; 18% in health sciences; 26% in applied arts; and 11% in all other programs.[18] Finally, 4% of the faculty had doctoral degrees; 34% master's degrees; 14% professional degrees; 26% either three of four year bachelor's degrees; 12% some university training and the remaining 11%, college training. Thus, the sample reflected the trend towards higher academic qualifications among college faculty mentioned earlier in this chapter.

As the survey was completed only recently, it was not possible to undertake a full analysis of the data within the time available for this report. Stephen Bell, a graduate student in the Higher Education Group at the Ontario Institute for Studies in Education who conducted the survey, will present a more thorough analysis of the data in subsequent publications. Nevertheless, a quick overview of the data did not detect substantial and systematic differences in responses on the basis of the attributes (gender, age, type of institution, and education) mentioned above. Thus, the following sections will refer to the entire sample, rather than to any subsets within it.

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[18] Faculty were asked to indicate the division to which the bulk of their teaching responsibilities were allocated. Faculty categorized as "other" were those assigned to a multitude of other divisions, such as hotel and restaurant management, natural resources, continuing education, etc.

The "Sub Rosa" Applied Research and Professional Activity Culture

Despite the fact that applied research activity is not within the mandate of the colleges, questions were asked to determine the extent of faculty involvement in various applied research and professional activities during calendar year 1988. The activities included both research activities, such as the publication of books or journal articles, and various forms of service, professional activity, and professional development that faculty might be involved in. The questionnaire also asked the extent to which these activities were considered characteristic of a teaching position at an Ontario college.

The results illustrate a surprising amount of research activity taking place in the college system. For example, in 1988, 7% of the faculty had served on the editorial board of a journal; 10% had received a research grant; 17% had reviewed proposals on behalf of a funding agency; 19% had published an article in an academic or professional journal; 24% had published or edited, alone or in collaboration, a book or a monograph; and 30% had delivered a paper at a professional meeting or conference. If the same questionnaire were sent to a sample of faculty members at Ontario universities, we expect that these results would probably be reasonably close to results for that population. Since there was no external verification of the responses claimed by the sample, such as a requirement that they give bibliographic citations, it might be that for some questions the level of activity was higher than would be found were there external verification. For example, it may be that some of the books or monographs that 24% claimed to have published were textbooks, course notes, or other teaching materials. Despite that caveat, there does appear to be a substantial amount of research activity going on.

The measures of service, professional activity, or professional development also are surprisingly high. 55% had engaged in systematic study to increase their knowledge or acquire a new research technique; 49% had worked with an external client to develop a new method or process for solving a problem; 37% had worked with an external client to adopt a new method or process for solving a problem; 33% had done some sort of paid consulting; 31% spent a week at a university to work with colleagues in their discipline; 20% spent a week at an industrial office or lab, and 10%, a week at a government office or lab for the same purpose. Once again, subject to the caveat that those sampled were not required to document their activities, there appears to be a high degree of participation in these activities.

Another measure of involvement in both research and other professional activities is that 176 faculty members, or 44% of the sample, spent an average of 4 hours per week on those activities during periods of the year when classes were meeting; 284, or 72% of the sample, spent an average of 6 hours per week on those activities during periods of the year when classes were not meeting; and 212, or 54% of the sample, spent an average of 6 hours per week on those activities during their two-month annual vacation period.

A number of questions in the survey show that, even though research is not officially in the colleges' mandate, they have begun to support the research activities of their faculty. Eleven percent of the faculty members have received release time paid by their college to do research; 4% have had research assistants paid by their college; and 8% have been allocated space by their college for research. A full 27% have received some allocation for technological research support (such as computers and software) from their college.

Another question asked faculty members to indicate agreement or disagreement with a number of possible barriers in the college system to doing research. On a scale where 2 is strong agreement; 1 is agreement; 0 is neutral; -1 disagreement; and -2, strong disagreement; the following are the averages for the sample for the extent to which each factor is a barrier to doing research:

1)	Low value placed on research by college administration	1.2
2)	Difficulty obtaining funding	1.1
3)	Heavy teaching load	.9
4)	Lack of resources to act on findings	.8
5)	College mandate excludes research	.6
6)	Inadequate college library holdings	.6
7)	Lack of research facilities	.6
8)	Low value placed on research by other faculty	.5
9)	Inadequate preparation to do research	.1
10)	Lack of qualifications to do research	-.5
11)	Not interested in doing research	-.7

It is clear that the individuals surveyed put the onus for the barriers to research on the system, in terms of lack of support and encouragement, to a much greater extent than their own backgrounds, preparation, and interest.

A number of other questions were asked that attempt to assess the faculty members' desire to do applied research. When asked whether they agreed or disagreed with the statement that " the formal inclusion of applied research in the College mandate would lead to greater faculty satisfaction if encouraged and supported through time release and other appropriate measures," 39% strongly agreed; 42% agreed; 13.5% were neutral; only 5.4% disagreed; and .5% strongly disagreed. (This would be an average of 1.1 if the same scale between +2 and -2 is used as was employed for the previous question).

Faculty members were asked how they would prefer to spend their time — namely whether they wanted to spend more or less time on various activities. On a scale where much more time is 2; more time is 1; the same is 0; less time is -1; and much less time -2; the averages for the group were as follows:

Research and professional writing	.81
Conferring with colleagues	.75
Working with a relevant professional society	.74
Improving educational qualifications	.71
Outside consulting	.62
Planning instruction or teaching	.62
Giving lectures or seminars outside class	.57
Interacting with students outside class	.57
Promoting or marketing college programs	.53
Classroom instruction or teaching	.01
Marking or testing	-.43
Administrative activities	-.61

These results show that research and professional activities rank high as areas where faculty members would like to spend more time, while they would like to spend just the same amount of time on teaching. The results also show that marking or testing and administrative activities are areas where faculty would like to spend less time. Adding up the factors on which they would like to spend more time against those on which they would like to spend less, it is clear that the aggregate is positive, that is, that they would like to spend more time in total on their work.

Another question asked the percentage of their working time, per week, that faculty members would prefer to spend on each of a number of activities. Logically, this question must sum to 100%. The averages for the group are as follows:

1)	Classroom instruction or teaching	35.4%
2)	Planning instruction or teaching	11.6%
3)	Research and professional writing	8.2%
4)	Improving educational qualifications	7.5%
5)	Interacting with students outside class	6.9%
6)	Marking or testing	6.6%
7)	Conferring with colleagues	5.5%
8)	Outside consulting	4.1%
9)	Work with a relevant professional society	3.8%
10)	Giving lectures or seminars outside class	3.5%
11)	Promoting or marketing college programs	3.5%
12)	Administrative activities	3.1%
	Total	100.0%

It is unfortunate that the questionnaire did not ask respondents the percentage of their time they currently spend on these activities. If we assume that people were giving consistent answers on the question of their desired allocation of time and on the change from their current time allocation to move to the desired, then we would have to conclude that they are spending quite a small proportion of time on the activities which they would like to increase, such as research and professional writing, working with professional societies, and outside consulting. On the other hand, the profile of desired time allocation indicates that the faculty want the colleges to remain primarily teaching oriented institutions, as they would still prefer to spend a total of over 60% of their time in teaching (that is, preparation, in the classroom, grading, or meeting with students).

Another way to grasp the "sub rosa" professional culture is by examining the question which asked the extent to which the various research and professional activities were characteristic of the role of a college faculty member. On this question, 0 indicates that a role is not characteristic; 1, that it is somewhat characteristic; 2, moderately characteristic; 3, highly characteristic; and 4, very highly characteristic. The averages for the sample were as follows:

1. Research Activities

Being on the editorial board of a journal	.46
Reviewing grant proposals	.54
Receiving a grant	.71
Reviewing journal articles	.78
Publishing a journal article	1.07
Submitting a journal article	1.09
Publishing a book or monograph	1.12
Delivering a paper at a conference	1.38

2. Service and Professional Activities

Spending a week in a government office or lab	.94
Doing paid consulting	1.14
Spending a week at a university	1.23
Working with a client to adopt a new method	1.28
Spending a week in industry office or lab	1.33
Working with a client to develop a new method	1.42
Learning new knowledge, research technique	1.73

These results indicate that, on average, faculty members consider these activities somewhat characteristic of their work. Thus, faculty members are saying that, whatever the formal mandate of the colleges includes or excludes, these activities are frequently done by college faculty. If we were to compare these results with university faculty, we would probably find that most of these activities are considered more characteristic of their work.[19] Nevertheless, these answers show that college faculty members are developing an organizational culture which gives increasing importance to applied research and other ongoing efforts to broaden and deepen their knowledge.

Measures of Job Satisfaction

A series of questions were asked about job satisfaction. General indexes of job satisfaction were quite high, but there were a number of specific irritants. One question asked their overall attitude toward community college work as a career, on a scale from +2 for very satisfied to -2 for very dissatisfied. The average was 1.11, slightly above satisfied. Eighty-two percent were satisfied or very satisfied; 11%, neutral; and 6% dissatisfied or very dissatisfied. The highest level of dissatisfied or very dissatisfied was in the business colleges at 9.5%. A second general question asked people whether they would find remaining in their present position for another five years very attractive (+2) to very unattractive (-2). Here, the average was .75, or moderately attractive. Sixty-eight percent found it attractive or very attractive; 16% were neutral; while 16% found it unattractive or very unattractive. Again, the highest level of dissatisfaction was in the business colleges, where 22% found the prospect of remaining another 5 years unattractive or very unattractive.

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[19] While we do not have a similar survey for faculty teaching in Ontario Universities, Pellino, Blackburn, and Boberg undertook a study of college and university faculty in the U.S. The faculty at the most prestigious U.S. universities mentioned these items as between moderately and highly characteristic of their work, while those at less prestigious universities indicated that these items were between somewhat and moderately characteristic of their work. See G. R. Pellino, R. T. Blackburn, A. L. Boberg, "The Dimensions of Academic Scholarship: Faculty and Administrative Views," *Research in Higher Education*, 20:1, 1984, pp. 103-115.

The more specific questions dealt with job satisfaction in terms of a number of aspects of work. The following are the averages for the sample, ranging between +2 for very satisfied to -2 for very dissatisfied:

Enjoyment of teaching	1.27
Relations with students	1.24
Relations with colleagues	.92
Freedom to choose textbooks, programs, media	.85
Job security	.65
Status as a teaching master	.60
Salary	.39
Work environment in general	.13
Relations with college administrators	.11
Opportunities to be creative	-.07
Feeling of working to highest potential	-.17
Quality of student	-.25
Status of community college	-.27

Taken together, these questions suggest that college faculty are reasonably satisfied, but there are a number of specific areas which could be improved, in particular providing opportunities to be creative and to work to one's highest potential, both of which could be facilitated by establishing a culture that puts more emphasis on applied research and professional activities, in addition to teaching.

Conclusion

The broad question this section started with was whether there was any support from within the faculty for initiatives to increase applied research and professional activities on the part of college faculty. The strong conclusion that emerges from the survey of faculty activities, preferences, and attitudes is that there is a receptiveness, indeed a widespread desire, for the establishment of a culture that puts more emphasis on applied research and other professional activities.

Enhancing Applied Research in the Ontario College System

Previous sections of this chapter explored the rationale for greater involvement of college faculty in applied research and presented examples of applied research activity in Ontario and other jurisdictions. A recent survey of college faculty indicated that there already is a "sub rosa" culture of faculty involvement in applied research and professional activities, and that faculty members at Ontario colleges strongly desire greater support and encouragement from the colleges for such activities. The objective of this final section is to outline a number of concrete recommendations as to how this greater orientation to and involvement in applied research could be implemented within the Ontario college system.

1. Reduce Faculty Teaching Loads

Currently, the Ontario college system is spending approximately $ 1 billion per annum on faculty salaries. At any given time, 2% of the faculty complement is on sabbatical leave, involved primarily in some sort of research activity. Thus, the current cost of faculty sabbaticals is 2% of $ 1 billion, or $ 20 million. Suppose that sabbatical leave were widely distributed throughout the system and used to support applied research, so that, for example, 8% of college faculty received 25% teaching reductions to do research. Furthermore, assume that this were doubled, so that, following the same example, 16% of college faculty would receive teaching reductions.

The cost of this option would be substantial. If we assume that all existing classes must be taught, and that there is no slack to be taken up by consolidating classes, then this option would cost $ 20 million dollars. Even if a substantial portion of this reduction in teaching could be funded by various internal economies within the college system, the cost to the government would still be substantial. It is unlikely that the Ontario government could find the money, especially in the face of competing demands from the universities, to fund a substantial increase in applied research being done at the colleges by reducing faculty teaching loads. Furthermore, it might be argued that, with a sub-rosa, rather than fully functioning, applied research culture at the colleges, a substantial portion of these dramatically increased resources for applied research might be wasted, especially at the outset of the program.

2. An Office of Applied Research in the Ontario College System

A less expensive, and potentially more effective alternative, would be the establishment of an Office of Applied Research within the Ontario College System. The logical place to house such an office, since it would be serving the entire college system, would be within the Council of Regents. This Office of Applied Research would be modelled, at least in part, on the Offices of Research or Research Administration within all of Ontario's universities. Those offices are responsible for administering research grants, keeping faculty informed about the various research grants available, and helping faculty apply for grants. Along those lines, an Office of Applied Research in the college system would have a substantial task to perform as an "animateur", so as to introduce a culture putting greater emphasis on applied research into the college system.

The Office of Applied Research would have a number of tasks:

1. Gathering detailed information about applied research, related professional activities, interests, and capabilities at the colleges. This would necessitate going beyond the type of survey reported in this chapter and finding out what college faculty members are actually publishing and where they are consulting. Based on this information, the Office of Applied Research would be able to spot areas of strength, potential networks, and groups that share common interests.
2. Based on the first task, the Office of Applied Research would develop a register of college faculty members and staff willing and qualified to carry out applied research projects, together with their areas of expertise.
3. The Office of Applied Research would approach various agencies and programs that support applied research, such as the SSHRC, the NSERC, the NRC, the Industrial Research Assistance Program (IRAP), the Canada Council, IRPP, and the various foundations. In many cases, these agencies have no policies preventing the funding of applied research within the colleges, but, due to limitations of their own administrative resources, have just ignored the colleges and concentrated on the universities. In such cases, the Office of Applied Research would simply take the responsibility of making sure that information about these granting bodies, calls for proposals, etc., were made available to faculty and staff at all colleges throughout the province. In cases where there are policies preventing the funding of applied research within the colleges, it would be the responsibility of the Office of Applied

Research to argue for their reform. In addition, the Office of Applied Research would be responsible for assisting college faculty and staff in preparing applications and proposals.

4. The Office of Applied Research should have a fund to support a small program of grants for college faculty and staff, perhaps in the order of $500,000 per annum. An example of this is the program to support research in Quebec CEGEPs run by the Fonds pour la Formation de Chercheurs et l'Aide a la Recherche of the Quebec Government. In the 1988-89 academic year, this fund gave $ 474,000 in grants to 73 people who were either members of CEGEP faculty or unaffiliated researchers. This was a small proportion of the total of $ 23.7 million in research grants given out by the Fonds. Such grants covered research expenses. In addition, applicants received release time from their teaching, but the $ 474,000 total is exclusive of any valuation of release time.

   A similar program in Ontario could be managed by the Office of Applied Research, with a peer review process handled by college faculty. Starting such a program, and encouraging competition for grants, would have the benefit of making applied research much more visible and more of a priority within the college system. These grants could be awarded on the basis of excellence or there could be themes or topics given priority. The federal funding agencies follow both practices. In addition, if there are initial difficulties in convincing funding agencies to open their competitions to the colleges, a record of successful research support through such a fund would be a powerful argument to convince them to change their policies.

5. Another major function for the Office of Applied Research would be to seek partners and collaborators for applied research activity based in the colleges. This would involve contact with the universities, and with business, labour, government, and the non-profit sector to find projects to which the colleges, based on their strengths, could contribute. In approaching the universities, the Office of Applied Research would be asking for greater access for college faculty and students to university research facilities, such as libraries and laboratories. In its approach to labour, the Office of Applied Research might propose joint research on such topics as the sociological effects of changing workplace technology. In its approach to business, the Office of Research might stress applied research projects which would be of immediate value, and which business would be willing to support financially.

6. Most or all of the colleges currently have research offices, which are responsible for various statistical studies and planning activities. The Office of Applied Research could work together with the individual college research offices in system-wide projects concerning such issues as research on student needs, including access by multicultural groups and the educationally disadvantaged, and research on the employment experience of recent college graduates.

7. The Office of Applied Research would develop an applied research agenda for the college system. This agenda would be based on the interests and capabilities of college faculty members, and the needs of potential clients, such as business, labour, government, and the non-profit sector. So, for example, it might include studies on the sociological effects of changes in workplace technology and studies of the application of expert systems in areas for which colleges train personnel, such as nursing and policing. The agenda could also include applied research on instructional methodologies, based either on experience within the colleges or on the cooperative educational experience of college students, for example in early childhood education. This work could be exported under the auspices of the Canadian International Development Agency (CIDA) or the International Development Research Centre (IDRC).

A final consideration is what such an Office would cost. Probably, the Office could be started for something around $ 250,000 per annum. This would include the cost of one professional staff member, one support staff person, and travel and related expenses. The initial year would be spent on surveying the colleges; meeting with business, labour, the universities, and government; determining research priorities; and developing plans for additional programs, such as a fund to support research by college faculty members.

Once programs are in place, it must also be the responsibility of the Office of Applied Research to do evaluations and cost-benefit assessments to ensure that the programs are efficient and effective in stimulating applied research, and that there are benefits to the people of Ontario.

This proposal has the advantage that it is incrementalist and consultative. It does not involve additional expenditures of resources until such expenditures can be justified on the basis of the capabilities of the universities and the needs of potential clients. It would involve the entire college system, in particular in ways which encourage the building of research networks among the colleges and between the colleges and other institutions. Finally, the proposal in no way detracts from the primary objective of the colleges, which is that of developing the skills of the students, nor the primary activity, which is teaching. Rather, it provides support for applied research because it will improve morale and job satisfaction within the colleges and ultimately increase the quality and relevance of instruction at the colleges.

Appendix

Table 1

Examples of Applied Research and Development Activities in the College System

Objective	College Role	Examples	Possible Economic Benefits
Applied research (production & application of new knowledge)	Centres of excellence Research consortia Cooperative research	I.S.T.S. O.C.R.I. N.A.I.T., Univ. Sussex Cegep de La Pocatiere Cegep de Jonquiere Sheridan College	New products & services New production processes High-tech equipment available to college for teaching, faculty development, student opportunities
Technology transfer	Share equipment & facilities Faculty consulting Sabbaticals	N.A.I.T. Cegep de La Pocatiere Cegep de Jonquiere Ohio Technology Transfer Organization	State-of-the-art technology available to business Feedback to classroom
New business development	Entrepreneurial assistance Market analysis	Sheridan College Wichita State University West Virginia University	New start-up firms New jobs Regional economic development
Technical assistance	Small business development centres Faculty consulting	Fleming College Sheridan College	Aid to business in adopting effective manufacturing & production concepts Faculty development
Economic research & analysis	Survey local business & non-profit sectors to assess training and labour needs, technological requirements	Fleming College Annual labour market & training needs assessment survey (Centennial, George Brown, Seneca Colleges)	Provision of objective information, leading to improved decision making in the public & private sectors, furthering an area's economy Public service
Human resource development	Tailoring education programs to meet new training requirements	Fleming College Emerging Technologies Consortium (Ohio)	Skilled workers appropriate to new technologies, updated skills Lifelong learning Revitalized curricula
Improved accessibility to higher education and training for under-represented groups	Needs assessment of local community, development of appropriate access & educational strategies	"Access to Potential: A Two-Way Street." M. Hynes. George Brown College	Increased participation of minority groups in highly skilled occupations. Larger pool of skilled labour. Public service activity Increased community support
Meeting needs of the growing senior population	Community needs assessment Development of appropriate programming	"The Educational Needs & Interests of Senior Citizens in Metropolitan Toronto." S. Rudin. George Brown College	Public service Community support
Optimal utilization of skills of college personnel in meeting needs of the community	Coordination of registry of expertise within the college system, research proposals, development opportunities Cooperative initiatives	Illinois Research Network	Improved accessibility for public & private sector interests to college expertise Opportunities for college staff

Colleges and the Changing Economy

Background Papers

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Choosing Equity and Prosperity: Access to College and the Ontario Economy

Study Team 2

Choosing Equity and Prosperity:
Access to College and the Ontario Economy

Summary

Almost all who are disadvantaged by reason of class, sex, race and ethnicity, language, age, geographical location, or physical capacity, or just plain luck, have the legitimate desire to better their situations and the situations of individuals in their households and other groups. This desire, it is argued, is consistent with the requirements of a rapidly changing formal economy and of its rapidly changing relations with the domestic and volunteer sectors where production also takes place. There exists a happy coincidence between our democratic equality and economic efficiency impulses.

The accelerating pace of economic change and the strategic choice to favour high-value-added, high-wage labour force activity demand workers who can learn rapidly and who have high skill levels. These demands in turn require increased access to education, much of which the colleges are well placed to provide. They are widely dispersed across the province and are particularly attuned to the communities they serve and to the employment needs of Ontario society.

Although the colleges have contributed substantially during their 20-odd years in existence to making post-secondary education more accessible, much remains to be done to tap the potential of individuals from all segments of Ontario society as we prepare for the economic challenges of the next century. Simply put, we cannot afford to waste that potential.

The core section of this paper addresses the issues affecting labour force supply. More specifically, it focuses on the barriers to equal access that still confront disabled persons, older workers, women, the poor, and members of diverse racial and cultural groups, including Native Peoples and first-generation immigrants.

Other sections of the paper sketch recent trends in the characteristics of the college student population, factors affecting the demand for labour, and aspects of the public policy context that particularly influence the supply of, and demand for, labour. Acknowledging the contributions that employer-based training and that short courses and counselling from community-based agencies can and must make, the paper argues that, on the mutually reinforcing grounds of equity and efficiency, the colleges have a central contribution to make in the provision of general education, generic skills and high-level career-oriented programs to a broader range of Ontarians.

Le choix entre l'équité et la prospérité : l'accès aux collèges et à l'économie de l'Ontario

Sommaire

Presque toutes les personnes qui sont désavantagées en raison de leur classe sociale, de leur sexe, de leur race, de leur langue, de leur âge, de leur lieu de résidence, d'un handicap physique, ou celles qui sont tout simplement malchanceuses, ont le désir légitime d'améliorer leur situation et celles des membres de leur famille et d'autres groupes. On soutient que ce désir est suscité par les changements rapides de l'économie et les transformations rapides des relations intérieures et celles touchant le secteur du bénévolat, qui sont également des sources de production. À cet égard, il existe une heureuse coïncidence entre les principes démocratiques d'égalité et la volonté d'accroître l'efficacité de notre économie.

Le rythme accéléré des changements économiques et la décision stratégique de favoriser un degré élevé de valeur ajoutée et des activités exigeant une rémunération élevée de la main-d'œuvre nécessitent que les travailleurs puissent être formés rapidement et qu'ils possèdent un niveau élevé de compétence. Ces demandes exigent du coup un accès accru à l'éducation, particulièrement celle assurée par les collèges. Ceux-ci sont bien répartis à travers la province et leurs activités sont bien adaptées aux besoins des collectivités qu'ils desservent et aux besoins de main-d'œuvre de la société ontarienne.

Même si les collèges ont contribué de façon très importante, au cours des 20 dernières années, à rendre l'éducation postsecondaire plus accessible, il reste encore beaucoup à faire pour mettre en valeur le potentiel individuel des personnes faisant partie de tous les segments de la population ontarienne si nous voulons être en mesure d'affronter les défis économiques du siècle prochain. En d'autres mots, nous ne pouvons nous permettre de gaspiller ce potentiel.

Le principal chapitre de ce document traite des questions se rapportant à la disponibilité de la main-d'œuvre. De façon plus précise, il aborde la question des obstacles à l'égalité d'accès à l'emploi auxquels font face les personnes handicapées, les travailleurs plus âgés, les femmes, les pauvres, de même que tous les membres des groupes raciaux et culturels, y compris les autochtones et les immigrants nouvellement établis.

Les autres chapitres du document donnent un aperçu des tendances des caractéristiques de la population étudiante des collèges, des facteurs ayant une influence sur la demande de main-d'œuvre et des politiques gouvernementales qui ont des répercussions sur l'offre et la demande de main-d'œuvre. Tout en reconnaissant la contribution des programmes et des cours de formation professionnelle offerts par les employeurs et des services de consultation assurés par des organismes communautaires, le document soutient que les collèges ont une contribution fondamentale à faire à l'égard de l'équité et de l'efficacité en matière d'éducation, d'acquisition d'aptitudes de base et de programmes de formation professionnelle avancée à l'intention d'une proportion plus étendue d'Ontariens.

Table of Contents

Page

Introduction 1

Profiling College Students 2

Labour Force Supply 4

- Disabled Persons 5
- Older Workers 6
- Women 7
- The Poor 9
- Diverse Racial and Cultural Groups 11
- Native Peoples 11
- Immigrants 12

The Demand for Labour 14

- The New Global Economy 14
- The Restructuring of the Ontario Economy 16
- New Technologies 17

The Public Policy Context 18

- Immigration Policy 18
- Canadian Jobs Strategy and the Ministry of Skills Development 19
- Free Trade 20
- Employment and Pay Equity Programs 21

Concluding Remarks 22

References 23

Introduction

A quarter-century ago in The Vertical Mosaic, John Porter (1965: 165) claimed that, "No society can move into an industrial epoch with so much of its creative potential incarcerated in ignorance." Early in 1989, the Institute for Research on Public Policy (1989: unpaginated) concluded on the basis of its economic research that, "social investment in the creation and diffusion of knowledge, in education and training is seen as a fruitful and productive investment — not just frivolous public consumption — and human capital is recognized as a durable asset on which longer term relationships in the organization of labour must be built".

Much has changed since Porter wrote The Vertical Mosaic. Post-secondary education, especially at the college level, has become more accessible. Technology, and more specifically the new information technology (cf. Wolfe, 1989), is fundamentally changing the workplace, and the economy is being restructured as it becomes more integrated into the global system. Women, the disabled, the poor, visible minorities, and Native Peoples have in many instances become more vocal and more organized. What does not appear to have changed is the happy coincidence of the democratic equality and economic efficiency impulses emphasized by Porter. What has also not changed is the persistence of inequality. Education, training, and jobs are not equally accessible to all.

Those who are disadvantaged by reason of class, sex, race and ethnicity, language, age, geographical location, physical capacity, or just plain luck have the legitimate desire to better their situation and that of others like them. Access to suitable education and training is central to this goal, because it means that people then have the opportunity to make choices and shape their own lives. This desire is consistent with the requirements of a rapidly changing formal economy and with the needs of the rapidly changing domestic and volunteer sectors where production also takes place. A better educated labour force also means that this province as a whole can have more choices to make; and that it can do more to shape, rather than merely be shaped by, its place in the changing world economy.

Debates rage over the extent to which work will be deskilled as the economic structure is transformed. There is no debate, however, over the accelerating rate of change in the labour force and in the domestic and volunteer sectors. Similarly, there are great debates about how best to position Ontario and Canada in the emerging global economy but little disagreement about the need to centre the formal economy on high-value-added, high-wage labour force activity. Rapid change requires workers who can learn rapidly to adapt. High-value-added work requires high skill and literacy levels. Both require increased access to education. Indeed, with a highly educated workforce, we would be better able as individuals and as a province to shape the consequences of the new economic structures.

The challenge then is to meet the anticipated demand for high-skilled, flexible workers who can fill a complex range of rapidly changing labour force jobs and volunteer and domestic tasks outside the formal economy. The needs for generic education and training and for a pervasive orientation to lifelong learning stem precisely from the fact that we cannot predict with any degree of certainty the exact future characteristics of these changing jobs and tasks. We can, however, state with some assurance that they will depend less and less on brute strength, and that employment equity factors will play an increasing role in filling them. We can work to make sure that this is the case. On the supply side, we know that we will have to rely increasingly on educating our existing pool of adults on a continuing basis. Persistently low fertility rates and low immigration rates of those bringing to Ontario the range of skills required will mean that we will be less and less able to rely on vast supplies of new workers to fill the demand for new skills. The economic challenge is to meet this demand.

The colleges are well placed to contribute further to the achievement of increased access for all groups within the province and to provide people with basic education and skills. They are particularly attuned to the communities they serve and to the employment requirements of Ontario society. In order to ensure better access to college and more appropriate responses to community and province-wide needs, the colleges will, however, have to examine closely who now benefits and who in the future could benefit from college education. We cannot afford to waste the potentials of any Ontarians in the just and prosperous Ontario that those in the colleges can help to shape.

The next section of this paper sketches recent trends in the characteristics of the Ontario college student population. Age, marital and parental status, sex, ethnic background, language, and student aid are briefly treated. The following section concerns issues affecting labour force supply, addressing some of the barriers to equal access that persist. The focus here is on disabled persons, older workers, women, the poor, and members of diverse racial and cultural groups, including Native Peoples and first-generation immigrants. Then comes a section on the demand for labour, with sub-sections on the new global economy, the restructuring of the Ontario economy, and new technologies. In the final substantive section, four selected fields of government policy with implications for labour supply and demand are considered. Specific attention is paid here to immigration policy, the Canadian Jobs Strategy and the initiatives of the Ministry of Skills Development, free trade, and employment and pay equity programs.

Throughout, the discussion is informed by the need to better prepare all current and prospective workers in Ontario to contribute in an economic and social setting characterized by rapid change and by demands for increased education and skill levels. It would be futile to attempt to predict with any precision just what these demands will be. What Robert Arn states about the software industry most assuredly has broader application.

> We are moving towards artificial intelligence — software technology that is based in the realms of uncertainty, where logic is fuzzy, where large amounts of data have unclear relationships between their independent variables. This area is precisely the area that I find closest to the Humanities because the Humanities have had to deal with large amounts of often unclear data in which the relationships are not clear (quoted in OCUFA, 1989: 4)

Given our certainty about uncertainty, it is possible that Ontario's approach should be similar in at least one respect to that of the West German vocational education system, which "creates workers who are 'overqualified' for their initial entry jobs and perhaps even for many of the positions along the promotion trajectory normally associated with those jobs. This phenomenon has helped to ease the incorporation of new technology into production and hence has made more flexible deployment possible" (Osterman, 1989: 8). Whether or not 'overqualification' is part of the solution, Ontario workers clearly need to be armed with sufficient knowledge to enable them to move in ways that are not only advantageous for themselves but also efficient for the economy.

The colleges have a crucial role to play in the mutually reinforcing achievement of both equity and efficiency. As the author of the discussion paper recently released by Vision 2000's Study Team 4 put it, "It would not be difficult to argue that, for both social and economic reasons, [investment through the colleges in upgrading and in the development of the higher skills levels required in the future] might be deemed efficient" (Ontario Council of Regents, 1989b: 13).

Profiling College Students

In order to meet the requirements of our dynamic economy for access to college, it is essential that we chart in some detail the college record on access. In a perfect research world, there would be a host of student characteristics worth analyzing in order to gain a complete understanding of the extent to which the college system serves Ontario society on an equitable, efficient basis. Inevitably, of course, the research world is imperfect. Constraints of time, space, and other resources impose the need for choices. Issues not chosen for analysis may in fact be particularly salient, and all that can be done is to make the choices as informed as possible by considerations of social theory and public policy. Moreover, the data that are available at all readily may be suspect. An example here would be the student reporting of parental income. Finally, the classification schemes that are readily available may be of little utility. This would apply, for instance, to occupational classifications. To lump together all managerial, professional, and technical occupations or all clerical, sales, and service occupations may conceal more than it reveals about equality of opportunity across generations, while to consider independently each of the 500-odd occupations making up the standard classification scheme would be to produce results of dubious statistical significance.

A research effort relying in the main on secondary sources to explore the characteristics of college students suffers from a further limitation. As Anisef (1988: 66) among others has pointed out, they have been much less studied than their university counterparts, notwithstanding their significant numbers. In Ontario, there are currently close to 100,000 full-time post-secondary college students, which is about half the number of full-time university students, but they receive nothing like half as much research attention.

Nonetheless, we can with assurance make many observations about the Ontario college student population. Increasing proportions of them are 25 years of age and older. In the Fall 1976 term, 10.3% of full-time post-secondary college students in Ontario were at least 25, while by the Fall 1987 term, a full 16.5% were 25 and over. By comparison, only 13.3% of the full-time undergraduate population at Ontario universities were 25 and over in Fall 1987 (calculated from unpublished OCIS and USIS data from the Ministry of Colleges and Universities). Unlike the undergraduate situation, where more males are in the older category, at the college level many more females are in this category. As would be expected, the proportions 25 and older are much higher for part-time than for full-time college students, but the rate of growth is faster for the full-time group.

Although both male and female college students are now more likely than before to be in the older category, only female full-time students are more likely to be married. Both male and female full-time students are more likely to have dependent children, a parental status embracing just over 5% of male full-time students and just under 10% of female full-time students in Ontario in 1983-84 (Anisef, 1989). Compared to full-time students, relatively more part-time students are married and have dependent children. Unlike the case for full-time students, however, the proportions of part-time students who are married and who have dependent children are declining.

The quite equal distribution of male and female students in both full-time study and part-time study at college masks the high degree of sex segregation that persists in several fields of study. According to the 1983-84 National Post-Secondary Student Survey (Anisef, 1989), in Ontario about 20,400 of the male full-time students, or almost exactly half the male full-time population, were in Engineering and Applied Science programs, where they constituted about 86% of the student body. Meanwhile, about 8,700 of the female full-time students, or about 21% of the female full-time population, were in Health Science programs, where they made up about 88% of the student body. The 6,100 or so female full-time students in Secretarial Science programs represented about 15% of the female full-time students and occupied about 95% of the full-time places in that program. Admittedly, these are the program areas in which the sex segregation is most stark, but it must also be remarked that finer detail within these broad program areas would produce evidence of greater sex segregation. The Health Science program area, for example, includes the Nursing and Nursing Assistant programs, which are heavily female; and programs such as Ambulance and Emergency Care, which are not.

From the same data source (Anisef, 1989), some indication of the ethnic backgrounds of Ontario college students is available. In 1983-84, 44.5% gave British (English, Scottish, or Irish) as the ethnic or cultural group to which they or their ancestors belong(ed), while 9.2% gave French, 8.4% gave German, 8.3% gave Italian, 2.1% gave Ukrainian, 1.2% gave Native Peoples (Status Indian, Non-Status Indian, Metis or Inuit), and 26.3% were forced to indicate "Other." There were few notable differences by sex or registration status (full-time or part-time) other than that those of German and, to a lesser extent, French backgrounds were disproportionately full-time while those of Ukrainian backgrounds were disproportionately part-time.

Bearing in mind that 9.2% indicated a French ethnic background, 6.1% indicated that French was the language first learned and still understood. Of this group, about 45% were taking all their courses in English, about 33% in a combination of English and French, and merely about 22% in French only.

Notwithstanding its centrality to issues of college access as well as to so many other matters of social concern, 'social class' is notoriously difficult and contentious to operationalize or to transform into readily measurable terms. What can be examined are patterns of student aid. In 1986-87, the Ontario Student Assistance Program (OSAP) determined that average student costs at college were 80.7% of average student costs at university, yet the average OSAP grant to college students was 91.4% of the average to university students. That same year, 85% as many college students as university students received OSAP grants, although there were only about half as many of them in total (calculated from Ministry of Colleges and Universities, n.d.). And according to the most recent unpublished data from the Ministry of Colleges and Universities, college students are noticeably more likely than university students to receive OSAP grants if they apply, whether or not they are deemed dependent on their parents. All this suggests, as might be expected, that college attracts students from a relatively less advantaged (or relatively more disadvantaged) section of society than does university but, unfortunately,tells us nothing about the representivity of the college student population.

Labour Force Supply

As birth rates fall and the population ages, there are growing concerns about future labour supplies. At the same time, there are many people in Ontario who are unemployed or underemployed, giving rise to concerns about the mismatches between people and jobs. Some of them already have the required knowledge and skills, but a variety of barriers — including certification barriers — prevent them from being hired to do the work that would fully tap their education and training. Others have skills that are no longer in demand, and still others lack the appropriate skills, the necessary literacy, or the basic education needed in order to fill the jobs now available in the labour force. Too few people are being adequately prepared for initial and stable employment in an economy undergoing rapid and fundamental change.

The next section of this paper addresses some key aspects of this change and its implications for college education. Here, the focus is on the people. In a context of a shrinking absolute supply of new workers, and of the mismatches associated with unemployment and underemployment, we simply cannot afford to deny people the educational and training opportunities to realize their potential economic contributions.

These opportunities are now disproportionately denied to particular kinds of people. A wide-ranging literature has documented the inadequacy of the current training and educational programs provided them by various public agencies and by employers (see, for example, Canada Employment and Immigration Advisory Council, 1985; CCLOW, 1986; McKeen, 1987; Seward and McDade,1988; Wismer, 1988; Yalnizyan, 1988; and Yalnizyan and Wolfe, 1989). A parallel literature has analyzed the unsatisfactory situations within educational institutions (see, for example, Anisef, 1988; Hynes, 1987; Pascal and Beales, 1987; Porter and Jasmin, 1987a and 1987b; and Radwanski, 1987). While it may be that, "In this field we do not need to re-invent the wheel: we need to use the wheel" (Canada, Senate Sub-Committee, 1987:23), progress has to date been slow in preparing people from disadvantaged groups for the kinds of jobs that will enable them, and with them the rest of us, to prosper.

To be sure, governments have recognized their failure in relation to certain groups such as the disabled, women, Native Peoples and 'visible minorities.' They have targeted these groups for priority action in many areas, including the introduction of employment equity programs with varying degrees of effectiveness. While these initiatives have improved conditions for some members of the target groups, even here progress has been slow and uneven. Meanwhile, older workers and the poor also face particular obstacles in their search for appropriate jobs, but have not been recognized as target groups. To bring together those from the target groups, and then to add other immigrant groups, older workers who are now or soon in need of new jobs, and the poor, is to assemble a substantial majority of the labour force. To reduce the barriers faced by people in these groups is thus to free up enormous economic potential. The unattractive alternative is to deny employment in well-paying, high-value-added jobs while labour shortages persist.

While we all benefit from the improved access by individuals to good jobs, and to the education and training at college and elsewhere required for these good jobs, employers benefit in specific ways. It is obviously in their interest to fill labour shortages as they arise with highly skilled and flexible workers who have learned how to learn. Moreover, government equity programs are pressuring employers to hire members of target groups and are discouraging practices that make it commonplace to hire from one group over another. For employers, therefore, the objective must be to have available, with a solid educational foundation and with the capacity to undertake retraining and upgrading programs, as many people as possible from as wide a cross-section of the population as possible.

We now turn to the consideration of those groups whose educational and employment disadvantages are particularly marked.

Disabled Persons

According to Statistics Canada data collected in 1986-87, there were 674,330 disabled persons in Ontario who were between 15 and 64 years of age and who resided in households (Statistics Canada, 1988a: Table 4). Half described their disability as mild and another 30% described it as moderate (calculated from Statistics Canada, 1988a: Table 4). Limitations in terms of mobility and agility were the most common problems. In other words, there were more than half a million people of working age in Ontario who were well enough to live outside institutions but who suffered from some form of disability.

With a labour force participation rate of 51% in 1986 (calculated from Statistics Canada, 1988a: Table 4), these disabled persons were less likely than the general population to be in Ontario's labour force. The overall participation rate for the province that year was 68.5% (Statistics Canada, 1986a: Table 61), a figure that includes individuals in the 65-and-over age group, where the participation rate drops off appreciably. Although almost half of the disabled who were employed indicated that they were limited in the kind or amount of labour force work they could perform, almost 85% of them held full-time rather than part-time paid jobs. This translates into about 36% of the entire 15-64 year disabled population with full-time employment and another 6.5% with part-time employment (calculated from Statistics Canada, 1988a: Table 4), suggesting both that the disabled are making a significant contribution to our formal economy, and that they constitute a resource that has not been fully tapped.

The official unemployment rate for the disabled who live in households was very similar to that of the general Ontario population. However, these figures camouflage the actual number of disabled who are willing and able to do paid work. Although 70% of those not in the labour force (and, therefore, not counted in unemployment data) were physically unable to work, a full 30% — close to 100,000 people — could have done paid work had suitable jobs or facilities been available (Statistics Canada, 1988a: Table 4).

The educational attainment of these disabled people is lower than that of the general Ontario population. A significantly higher proportion have not completed high school, and a quarter of them could be defined as functionally illiterate. According to the Statistical Profile of Disabled Persons in Ontario (Office of Disabled Persons, 1988: 10), non-disabled persons are "almost twice as likely to be enrolled in the educational system as disabled individuals." It is difficult to tell how much of the dropout rate can be attributed to the lack of a conducive environment and how much to incapacity, but it is likely that a significant percentage of these disabled could be better prepared for the job market if appropriate courses and facilities were available. Many would likely be happy to return to studies if colleges better accommodated their needs and better prepared them for meaningful employment.

As the Ontario Federation of Students (1988: 19) points out in its research paper on disabled students, "It is short-sighted to not invest more funding in literacy training for Canadians, especially disabled Canadians, in view of the likelihood that, without such training, they will be prevented from achieving economic and social independence." Indeed, it is short-sighted not to invest in a whole range of skill development programs that would equip the disabled for full employment in the labour force.

Approximately two-thirds of the disabled living in households became disabled after they had completed their formal education (Statistics Canada, 1988a: Table 4). Many can no longer perform the work for which they were trained. Once again, it is difficult to tell how readily these people could adapt their former education and skills to their new condition, but it seems likely that many of these newly disabled could benefit from courses that taught them new skills and helped them cope with their changed situation. In the process, many would likely become more independent and more readily employable.

The limited employment options for these disabled is reflected in their incomes. Half of the disabled 15 years of age and over who reside in Ontario households had total incomes of less than $10,000 in 1985 (Statistics Canada, 1988a: Table 3). By contrast, less than a quarter of the total population in Canada had employment incomes of less than $10,000 that year, notwithstanding the lower Canadian average incomes (Statistics Canada, 1988b). Expanded educational programs for these disabled would not only mean that many more could contribute to the economy and live above the poverty line but would also mean that fewer would be forced to rely on government support.

While slightly more men than women in the 15 to 64 year age group are disabled, disabled women face particular problems in finding employment and attending classes. Like most women, they bear primary responsibility for childcare but their disability often means that care is more difficult and time-consuming. With access to childcare services, many more of these women would be able to participate in both education and employment.

Under new employment equity programs, employers have to reconsider their employment practices and their work organization in terms of access for the disabled. These programs have grown out of our collective commitment to equity, but they should not be viewed simply as a cost induced by the equity commitment. Many of the new technologies are user-friendly and require less and less physical strength or manual dexterity, making employment more possible for people with various disabilities. Moreover, the new technologies make it easier for the disabled to get to work, to work at home, or to work part-time. The more than half a million disabled who reside in Ontario households could, with the appropriate opportunities in the educational system and in the workplace, make a greater economic contribution while increasing their economic and social independence.

Older Workers

Birth rates in Ontario have been declining over the last decade, and the baby-boom generation is entering middle age. The proportion of the population in the 45 to 64 year age group has been growing rapidly, and the growth rate of this age group threatens to exceed that of the total population. For an increasing number of men and women, however, middle age does not mean a settled employment pattern or a secure income. As of March, 1989, 57,000 Ontario residents in this age group were officially counted as unemployed, and most of these unemployed had indicated that they would like full-time employment. Another 556,000 were not in the labour force. There is every reason to believe that many of the 151,000 men not counted as members of the labour force would like at least some paid work. And, as rising prices and the prospect of long years with no pension from employment put increasing pressures on women, it seems likely that many of the 405,000 women in this age group not in the labour force want and need some paid work (Statistics Canada, 1988a).

Studies undertaken by Canada Employment and Immigration (1985 and 1988), by the Social Planning Council of Metropolitan Toronto (1988), and by the Labour Council of Metropolitan Toronto (Sobel and Meurer, 1988) all point to similar trends. "Economic restructuring and technological changes are rapidly proceeding in the very industries that employ large numbers of older workers" (Sobel and Meurer, 1988: 1). Although economic recovery reduced unemployment rates for workers in all age groups, during the early 1980s, "older workers suffered more, experiencing relatively greater increases in their rate of unemployment and the duration of unemployment" (Social Planning Council, 1988). Those who did find other work were frequently underemployed in jobs that paid less than their previous work. The "average cut in pay for an older man in 1987 was 23%. It was 28% for older women" in their new jobs (Social Planning Council, 1989: 5). Should the predicted downturn in the Ontario economy develop, many more of those between the ages of 45 and 64 will find themselves out of paid work.

These older workers are often unable to find new employment not because they lack skills but because either their skills are no longer in demand, or employers think their skills are no longer appropriate. Few employers invest in the retraining of older workers. Most employers prefer to train young workers, under the mistaken assumption that it is always easier to teach the young. Yet the very success of the few programs designed for older workers demonstrates that they can indeed learn new skills. Moreover, older workers bring a broad range of knowledge and experience that is lost when only younger workers are hired.

Finally, with the long-term decline in the birth rate, we can anticipate that there simply will not be enough young people available to fill the jobs requiring new skills. In the study they undertook for the Labour Council of Metropolitan Toronto, Sobel and Meurer (1988: 59) conclude that "there is a shocking lack of older-worker training" in the workplace. The Canada Employment and Immigration Advisory Council (1985: 18) found that "Canada Employment Centres do not appear to be encouraging unemployed older workers to consider training as an option," and that most older workers receive little counselling in terms of either job search or other adjustments to their new conditions.

Although most of these workers have a range of skills learned on the job, many lack some of the basic education required for the new technologies. They may be uncomfortable with traditional forms of educational instruction, or they may be ineligible because they do not have the formal qualifications for the programs that are offered. A higher proportion of women than men have participated in the mainly classroom-type training offered under the National Institutional Training Program, suggesting that the Program is particularly inaccessible to men. On the other hand, a higher proportion of men than women have been involved in the National Industrial Training Program, suggesting that on-the-job retraining has been more open to men (Canada Employment and Immigration Advisory Council, 1985: 17).

Unemployed, these older workers represent a significant loss in human resources, in years of accumulated knowledge and experience. Indeed, their skills may be lost to future generations if they are not reintegrated into the economy. Many forecasters are already warning that we may experience a severe shortage in the so-called skilled trades, and we may lose many less obvious skills as well. Moreover, as the Canada Employment and Immigration Advisory Council (1985: 9) pointed out, "a person who is working, spending and paying taxes is better for the economy than one who depends on government assistance." Unemployment increases costs, not only in terms of social assistance or unemployment insurance but also in terms of the costs associated with caring for those who experience increased psychological and mental problems as a result of their long-term unemployment (Kirsh, 1983: passim).

There is a clear role for colleges to play in response to the unemployment or underemployment of older workers, especially given the reluctance of employers and government services to do the job. Many of these workers require basic skills that will allow them to use the new technologies, while others need alternative skills. Many need courses in how to cope with their new conditions, whether or not they find new employment. Many need counselling in terms of how to look for work and how to undertake retraining. Many could be prepared for volunteer work or for retirement. Employers, too, could use instruction in how to utilize the knowledge of these workers, so their skills are not lost. As Soble and Meurer (1988: 59) have pointed out, "learning new tricks is more a function of teaching technique than of age."

Women

The numbers of women participating in the labour force and enrolling in college courses have been steadily rising throughout the decade. By 1988, 61% of Ontario women 15 years of age and over were counted as part of the labour force, and over half those in college were women (Statistics Canada, 1988b:

268). Moreover, these figures underestimate the actual number of women who were in the labour force at some point throughout the year. Recent Statistics Canada (1988c: Table 1) data indicate that just over 73% of Ontario women were in the labour force at some time during 1986, and it seems likely that the figure would be slightly higher for 1988. Women accounted for 45% of the Ontario labour force in 1988, up from 44% in 1986.

Although women are coming close to constituting half of the labour force, they are far from equally distributed across occupations and industries. While some women have moved into areas traditionally dominated by men (Marshall, 1987), nearly 60% of women, compared to 26% of men, work in clerical, sales, and service jobs (calculated from Statistics Canada, 1988c). Within these very broad occupational categories, much sex segregation persists. Indeed, as with college enrolment patterns, the finer the detail examined, the greater the segregation revealed (Armstrong and Armstrong, 1984:32-41).

While women have been very slowly closing the wage gap, occupational sex segregation is responsible for much of the significant difference that remains between female and male wages. In 1987, among those employed full-year and full-time, women were on average paid just under two-thirds of what men were paid.

Of course, the more than one in four women who were employed part-time were even farther behind their male counterparts (calculated from Statistics Canada, 1988b: 117). When all earners are compared, women made just 58% of what men earned (Statistics Canada, 1988c: Table II). Women are also more likely than men to experience unemployment. In 1988, the female unemployment rate was a full percentage point higher than the male rate.

Women who are recent immigrants, are from a visible minority group, are disabled, are older, or have been on social assistance are doubly handicapped. They are even more likely than other women to be segregated into dead-end jobs, paid significantly less than men, or unemployed.

Although women now constitute more than half the college population and more women than men have college diplomas or certificates, more women than men have eight or less years of formal education. Furthermore, as is the case in the labour force, patterns of segregation remain within educational institutions. As indicated in an earlier section, some women have moved into college courses that have traditionally been male-dominated, but women remain concentrated in secretarial, health sciences, community service, and social service programs.

When women have graduated from traditionally male-dominated programs, they are still paid less than men. For example, in 1984-85, the 727 women who graduated from technology programs "were averaging over a thousand dollars less per year" than their 5558 male counterparts. The median salary for men who graduated from the three-year Business Administration Program was two thousand dollars higher than that for female graduates (Pascal and Beales, 1987: 26). Indeed, education has a smaller payoff for women graduating from any course. "While poorly educated men (i.e., men 25+ with less than Grade 9 education) earned 81% of the average male wage, only women with university education earned a similar amount" (CCLOW, 1986: 100). Moreover, at each education level, women have a higher unemployment rate than that of men (Wismer, 1988: 1).

Women are also less likely than men to be enrolled in job-related courses outside traditional female fields and less likely to be in apprenticeship programs. "This may be explained, in part, by the finding that 58% of men's job-related courses, but only 44% of women's, were paid for by employers" (CCLOW, 1986: 54). An analysis of the Federal Government's Canadian Jobs Strategy concluded that "women are distinctly underrepresented in the Skills Shortages program, which provides training in skills in short supply. Further evidence points to the limited field of occupations in which most women have found training" (McKeen, 1987: i).

Along with rising female participation rates have come demands for programs that will help overcome this inequality. Ontario has introduced proactive Pay Equity legislation that requires all employers with more than 10 employees to develop plans to implement equal pay for work of equal value. This legislation should reduce the advantage of hiring women or men exclusively for some jobs. Employment equity programs have also been introduced to encourage employers to hire, train, and promote women. These programs mean that employers will face increasing pressure to search for female employees. It is then in employers' interest to have women develop a broad range of certified skills and recognized education.

Predictions of skill shortages also mean that it makes economic sense to teach these skills to the growing number of women who are entering the market. There is every reason to believe that women will continue to move into the labour force and to stay in the labour force after they have their children, even though the rate of growth in women's labour force participation may decrease. With declining birth rates reducing the labour supply, employers would benefit from a supply of women with the necessary skills.

With the advent of new technology, many women will find their current skills obsolete or those they have learned unrecognized. Given that one in three women does clerical work, and that a high proportion of these clerical jobs will be transformed by the new technology (Armstrong, 1984), we can anticipate that many of these women will need to develop alternate skills or add to their earlier formal education. With the restructuring of the economy, especially with free trade (Cohen, 1987), many women's jobs in the garment and manufacturing industries will disappear. A large proportion of the women employed in these jobs have little formal training and will require basic education in order to compete in the labour market.

Strategies of educators and employers have in the past tended to reflect the assumption that women provide a secondary labour force, one that can be drawn on when necessary and sent home when no longer required. Education and training for such workers has therefore not been a priority. But new legislation recognizes women's increasingly permanent attachment to the labour force as well as their unequal treatment and requires employer action to change their practices. Research (e.g. Pryor, 1984) has demonstrated that women's incomes are essential to meet the income needs of most households. This not only means that women are in the labour force to stay, but also that two-income households are the major means of staying out of poverty and off dependence on government transfer payments. It simply makes sense to provide women with the education and training necessary to fill the jobs increasingly available to them and required by them.

The Poor

According to the National Council of Welfare (1988: Table B), in 1986 there were almost a million Ontario residents who lived in poverty. One-tenth of the total population was poor. Unattached people were more likely than people in families to be poor, but there were still more than 200,000 Ontario families counted as living below the poverty line. Women and children constituted the overwhelming majority of the poor, although there were more poor families 'headed' by men simply because many more families in total are 'headed' by men. When women head lone-parent families, however, they "run over four times the risk of poverty as families with male heads" (National Council of Welfare, 1988: 19).

Contrary to popular myth, most of the poor receive little or no money from what is usually called welfare. In fact, "nearly three-fifths of all poor families headed by working age adults in 1984 were supported by someone working either full-time or part-time" (Social Assistance Review Committee, 1988: 300). Nevertheless, the families with the lowest incomes have become increasingly dependent on government support. The "total earnings of poorer families as a proportion of those received by the average family fell from 28.3% in 1970 to 24.3% in 1985. At the same time, the proportion of low-income families for whom transfer payments were the major source of income increased from 16.0% to 27.8%" (McQuillan, 1989: 13).

A major factor in this increasing disparity is the changing employment patterns of family members. The single most important reason for rising family incomes in recent years has been the movement of women into the labour force (Armstrong and Armstrong, 1984). Between 1971 and 1981, the income of wives "was the significant factor in preventing family income from declining in real dollars" (Pryor, 1984: 102). While two-thirds of non-poor families had at least two income earners, less than a third of low-income families had two or more earners. Moreover, within the low-income group, there has been "a rise in the number of families with no earners from 14.4% to 19.5%" (McQuillan, 1989: 18). Unemployment and underemployment keep many families below the poverty line.

A significant proportion of the increase in the number of families with no earner can be attributed to the increase in lone-parent families headed by women. Between 1971 and 1986, the percentage of all families headed by a lone parent increased from just under 10% to about 13% (Statistics Canada, 1989b: 10). Although half the women who head households are in the labour force, they are much less likely than other women to have paid work when their children are young (Statistics Canada, 1987: Table 61A). Most of these women cannot afford to work for pay when their children are young, given the high cost of childcare and the low wages paid to women. Many do not have recognized skills and education, factors which serve to further reduce their employment prospects.

As the Report of the Social Assistance Review Committee (1988:93) pointed out, "Employment continues to be one of the primary ways in which individuals contribute to the community, develop a sense of self-esteem and self-worth, and achieve self-reliance. Education and training are key stepping stones into the labour force." The majority of those receiving General Welfare Assistance were doing so because they were unemployed. Over 60% of these recipients had Grade 10 education or less. The Committee's analysis of those who are defined as employable but who are receiving social assistance "suggests that those with low skills, limited educations, and sporadic work histories continue to have difficulty re-entering the labour force" (Social Assistance Review Committee, 1988: 46). Similar statements could be made about those who do not live on social assistance but who do live below the poverty line.

Many of those not defined as employable are women who cannot seek paid work because they are responsible for their children. A large proportion of these women will have difficulty entering the labour force after their children have grown because their skills have become obsolete, because they have low levels of formal education, or because they have never had paid employment.

Equally important are the prospects of the children who grow up in these households below the poverty line. The Ontario Study of the Relevance of Education, and the Issues of Dropouts (Radwanski, 1987: 71) pointed out that "[V]irtually every study ever done on the dropout issue has found a strong link between family background and the likelihood of dropping out. The lower the income level, occupational status, and level of education of his or her parents, the greater is the statistical risk that any given student will not complete high school." Educational and employment opportunities for the parents today may help ensure not only that the parents move out of poverty, but also that the next generation will contribute more fully to the economy as well.

The Social Assistance Review Committee recommended that rules and procedures which serve to prevent social assistance recipients from upgrading their skills and continuing their education be removed. In line with these recommendations, the colleges have an important role to play in preparing these recipients for re-entry into the labour force. Colleges could also provide recipients with courses designed to encourage self-reliance, to increase life skills, and to improve the use of existing resources. Like older workers who suddenly find themselves looking for new jobs, these people too would benefit from college courses which informed people of their options and taught them job-search skills. Many of those who are currently employed but live below the poverty line could also benefit from such courses. Indeed, a major factor in their poverty is the instability of their jobs, and college courses could prepare them for jobs in other areas.

Many of those who are now dependent on social assistance could become independent if they had better access to education and had adequate support. Many of those who now live below the poverty line could improve their conditions if they too had the possibility of learning new skills and expanding their formal qualifications. Without better access to education and training programs, those currently employed may well find themselves out of work as the jobs labelled unskilled continue to disappear. Moreover, without the possibility of improving their access to the market through education, these poor adults will pass on their poverty to their children, in the process increasing our economic and social costs.

Diverse Racial and Cultural Groups

Ontario's diverse racial and cultural groups are composed of both immigrants and non-immigrants. While many of those frequently described as 'visible minorities' have entered the province in recent years, many have lived here for generations. There is some debate on whether 'visible minority' is an appropriate term, in part because who constitutes a 'visible minority' is difficult to determine and even more difficult to count. We do know, however, that in the 1986 Census 260,790 people in Ontario indicated their single ethnic origin as East and Southeast Asian, 135,140 as South Asian, 110,670 as Black, and 430 as Pacific Islands, for a total of 507,030, or 8.5% of those Ontario residents indicating a single ethnic origin.

An increasing amount of evidence suggests that these Canadians do not have the same opportunities as others in the job market, and that many of their talents are underused or underdeveloped. The Report of the Commission on Equality in Employment indicated that "[T]hose who had been in Canada for many years attributed their lack of employment opportunities to discrimination. They were people with recognized qualifications and proven job skills who found, nonetheless, that they were simply not promoted or given the same opportunities as whites with similar qualifications" (Abella, 1984: 50).

Many are discouraged from getting the credentials in the first place. According to the Deputy Minister of Education, "[C]oncern has been expressed, however, that young people with certain cultural backgrounds, some indigenous to Canada, and some originating in other countries, are being streamed into inappropriate programs before they have had time to adjust to the Ontario educational system" (quoted in Pascal and Beales, 1987: 41). A variety of research has exposed the problems faced in the college system (see for example Hynes, 1987) and indicated that many from these diverse racial and cultural groups not only find it difficult to get into adult educational programs at this level but also have little information on the availability of government training programs.

These barriers to education and employment mean that inequality persists, and that talents are lost to the labour market. They also mean that tensions arise and resources have to be allocated to containment rather than assistance. There is a growing demand for people who are members of these various racial and cultural groups to be involved in delivering services. Governments, both federal and provincial, have targeted 'visible minorities' for training and employment equity. By offering more accessible training and education to these diverse groups, colleges would be filling an economic need while helping promote equality.

Native Peoples

According to Statistics Canada, by 1984 there were 77,313 registered Indians living in Ontario, representing almost a quarter of the Canadian Indian population (Siggner, 1986: 3). The total number of native peoples residing in Ontario is much larger, given that these numbers do not include those of mixed ancestry, those who have lost their status under the Indian Act, those who have never had this status and those who are Inuit. Given the choice of indicating more than one origin in the 1986 Census, 99,555 Ontario residents indicated Native American Indian, 14,565 indicated Metis, and 2,285 indicated Inuit, for a total of 116,405 identifying themselves as Native Peoples.

Although the drop-out rate for Indian students has been declining in recent years, two-thirds still leave school before completing Grade 12. At the same time, the proportion attending post-secondary educational institutions is rising, but it "is still only about half that for the total Canadian population" (Siggner, 1986: 9). A significantly higher proportion of Native women than men are enrolled in post-secondary schools.

Disadvantaged in education, Native Canadians are also disadvantaged in the labour market. It is difficult to make precise comparisons with other Canadians, because traditional livelihood activities are often not counted as labour force work. Estimates indicate that less than 40% of those 15 years of age and over are in the labour force, and that the unemployment rate for Native Canadians is almost two-and-a-half times that of the general population (Siggner, 1986: 7). The unemployment rate for non-reserve women is even higher. And unemployment that occurs seasonally when hunting, trapping, fishing, or farming is not possible "among Native people carrying on traditional activities may never be reported properly because it does not fit into standard measures" (Sharzer, 1985: 561).

In terms of occupational distribution, Native Peoples are much more likely than the general population to be found in service jobs and in low-paying, seasonal, service jobs at that. This is particularly the case for women, given that one in four does this kind of work. Native men are much less likely than other men to have managerial, professional, or technical work (Siggner, 1986: 8) and are over-represented in construction, hunting, fishing, trapping, mining, and forestry (Sharzer, 1985: 562).

The occupational distribution and the high unemployment rates are reflected in incomes. "In 1980, the average annual income of the Indian population was 60% of that of the general population," and government transfer payments provided a third of the income for the working-age Native population (Siggner, 1986: 7).

Not surprisingly, given their current situation, Native Peoples are a target group for employment equity. If these first Canadians are to have an opportunity to participate equally in the labour market and to become economically independent, special programs will be necessary to help them learn new skills and new strategies for survival in the official labour force. As is the case for other target groups, it is in the employer's interest to ensure that they have the possibility of acquiring the requisite skills and the necessary basic education. Here, too, is an untapped labour supply with skills in other areas that could be adapted to current demands for labour on and off the reserve.

Moreover, better access to post-secondary education is necessary to fill "the need for appropriately trained and educated native people to serve native communities" (Sharzer, 1985: 564). This would assist Native Peoples in determining their own future, would make them more independent of government support, and would help end the cycle of poverty and deprivation that is all too familiar to Native Peoples.

Immigrants

Half of all those who immigrate to Canada come to Ontario. As of 1986, there were 2,081,195 first-generation immigrants living here (Statistics Canada, 1986b). "[S]ince 1925, immigrants to this province have come from over 86 countries and represent over 50 languages" (Hynes, 1987: 38). They have brought with them a variety of skills and have immigrated for a wide variety of reasons. In spite of this diversity, however, there are dominant patterns in immigration, with different groups dominating particular historical periods. And these patterns have different consequences for the labour market and the educational system, especially when considered in the context of changing economic conditions.

Over 90% of Ontario immigrants have arrived since the Second World War. The majority of those who came before 1946 were of British or French origin, and the next largest groups were German and Italian. Less than 1% spoke neither English or French, and less than 10% spoke a language other than English or French at home. Close to three-quarters of these immigrants are now beyond retirement age (calculated from Statistics Canada, 1986b).

The bulk of the immigrants currently residing in this province came in the immediate post-war years. Of those now counted as immigrants, 43% arrived between 1946 and 1966 in the height of the economic boom when many of their skills were in high demand. A quarter had British or French origins; another quarter, Italian or Portuguese. Again, the next largest group was German, representing almost 10% of those immigrating during this period. Less than 5% spoke neither official language, although a quarter spoke a language other than English or French at home. This population is also concentrated in the older age groups, with two-fifths now over 45 (calculated from Statistics Canada, 1986b).

Although the rate of immigration has declined since the decade after the Second World War, 350,000 immigrated to Ontario between 1978 and 1986. In contrast to earlier years, today "the majority of immigrants arrive from the Third World regions of Asia, the West Indies, and Latin America" (Hynes, 1987: 27, referencing Munro). Of those arriving between 1983 and 1985, a third speak either English or French at home, with the majority using neither official language. Most can speak English or French but 18% speak neither language. Two-thirds of those immigrating over the last decade are under age 35 and have many years ahead of them in the labour force (calculated from Statistics Canada, 1986b).

A significant proportion of these immigrants have technical, professional, or trade skills, and business expertise. Indeed, while only 8% of the non-immigrant population has a university degree, this is the case of 12% of the most recent immigrants (calculated from Statistics Canada, 1986b). "Many immigrants are granted entry to Canada as residents by Canadian officials based largely on their perceived labour market value" (Seward and McDade, 1988, 35). Their non-Canadian credentials may not be accepted once they are here, however, and many remain under- employed in Canada. Their skills, which were identified as in demand when they entered the country, may thus be lost to the economy.

A study undertaken for the Ontario Cabinet Committee on Race Relations (referenced in Seward and McDade, 1988: 32) recommended that Ontario develop a better method for assessing foreign credentials; a method that would not take race, sex, or ethnicity into account. This study indicated as well that many immigrants had to take courses which in effect required them to repeat their training in order to qualify for work in this country. Many could not afford to support themselves during this long retraining period, a retraining period which may not have been necessary in this form.

Colleges could play a critical role in assessing credentials for a range of areas and in preparing people for certification exams. They could also develop courses and offer supervised work placements which would help immigrants adapt the skills that they have already acquired to conditions in Canada. There are clear economic gains to be made by recovering skills that are in high demand.

Although many recent immigrants have needed credentials and a higher proportion than the Canadian population have completed university, an increasing proportion do not have English literacy skills, and many have little formal education. Of those who arrived between 1983 and 1986, 15% had less than Grade 9 education, 19% more were without a secondary school certificate and another 10% had completed their studies at the end of high school (calculated from Statistics Canada, 1986b). Many get locked into service and factory work that is low-level and low-paid. While only a quarter of the non-immigrant Ontario population did factory or service work, this was the case for 46% of the most recent immigrants. The disadvantage experienced by these most recent immigrants is also reflected in the fact that less than a third, compared to well over half of the non-immigrant population, are employed full-time, full-year (calculated from Statistics Canada, 1986b).

Immigrant women are even more disadvantaged than immigrant men. Only 20% of non-immigrant women do service and factory work, compared to 47% of the women who immigrated between 1983 and 1986 (calculated from Statistics Canada, 1986b). Although immigrant women are more likely than non-immigrant women to work for pay, they are much less likely to get full-time, full-year employment. Boyd (1980: 21) has pointed out that women who come from Great Britain and the United States have more opportunities than other immigrant women, but as Estable (1986: 23) makes clear, "being both foreign-born and female creates a double disadvantage in the workforce for all immigrant women in Canada and ... this double negative is what accounts for their lower occupational status, concentration in poorly paid and insecure occupations, lower income, and higher rates of unemployment."

Women from Southern Europe and from Asia in particular are heavily concentrated in the garment industry. Their limited English language skills, "together with limited work-related skills and education, forces Southern European and Asian immigrant women to take employment in the low-skill [sic] clothing industry where language skills are not necessary. The result is that they will have little opportunity to learn an official language or other job skills. Once in these job ghettos, immigrant women's occupational mobility is very limited" (Seward and McDade, 1988: 16).

As Ng (1986) has demonstrated, counselling and employment services tend to reinforce this ghettoization, rather than help immigrants move into different areas of work. Moreover, many of these women have entered the country as dependents, which means that they receive less support for language courses and for education or skills development than do those who come independently (Seward and McDade, 1988).

The workers in the garment industry are particularly vulnerable, both because the clothing industry faces increasing competition from Third World countries (Seward and McDade, 1988: 16) and because Free Trade will open Canada to more direct competition from the United States (Cohen, 1987). But all immigrants without English language skills are at risk. Without language skills, it is much more difficult for them to know their rights as employees. Without language skills, they are restricted to a very limited range of jobs and find it much more difficult to learn new skills through written instruction. The ability to communicate is becoming increasingly important in our information society, and more and more immigrants to this province will be unable to participate unless they have an opportunity to develop English language skills and expand their basic education. Those with language skills can fill the rising demand for the services specific to the diverse immigrant groups, services that will in turn help more immigrants adjust to their new circumstances.

With declining birth rates and the aging of the population, Ontario will have to rely increasingly on immigrants to fill the demand for labour. It is not sufficient to rely on immigration regulations to select skilled workers. The colleges must become better prepared to provide basic education and language training, as well as courses which allow immigrants to adapt their skills to Ontario conditions.

The Demand for Labour

The New Global Economy

The development of an international production system and the emergence of information as an internationally traded good has led many to talk of a new global economy. Made possible by electronic technologies and the growth of international capital, this new global economy has profound implications for internal labour markets. It creates new choices and new possibilities. Whether we become actors rather than observers in these developments, whether the jobs created are better rather than worse, will depend to a large extent on our investment in education and training.

Interviewed for With the Future in Mind, the environmental scan of Vision 2000 (Ontario Council of Regents, 1989a: 10), the Chairman and President of Northern Telecom offered this concise summary of major developments in the new global economy and the consequences for investment in education:

> The most dominant forces making the difference between now and the year 2000 will be both the intensification and the globalization of competition...the most visible manifestation being the surge of cross-frontier acquisitions, mergers, and alliances by companies in all parts of the world. The economic and competitive landscape is undergoing irreversible and far-reaching changes that are challenging the existing world order and, at the same time, challenging Canadian business to prepare now for a more competitive future...the emerging global economy is centred on information and knowledge and, in this environment, education is the essential raw material. Economic wealth is not so much in the ground today as it is in the minds of people — in their training, education and ability to understand and respond to the forces driving the intensification of competition. We're

> looking to our universities and colleges for much higher levels of performance. Excellence is the issue. A basic factor will be the rate at which the universities and colleges produce people with creativity, vision, professional expertness, and understanding of the competitive challenge we'll face when our future growth and prosperity will depend on Canada's ability to compete and win world markets. In an era when the world competes on new technology and new knowledge, education must be at the leading edge, because as the excellence of higher education suffers, so does economic performance. It's that simple and that challenging...

While the demand for highly educated and skilled workers will increase, there are contradictory tendencies in this new world economy. Not all the new jobs will be good jobs. As the Canadian Council on Social Development (Osberg, 1988: 36-37) made clear, many of the new jobs involve the kinds of assembly-line work that are low-paid. Increasingly, production is moved to Third World countries where wages and unionization rates are low. The goods produced by these largely female workers then compete with the goods produced by the more highly paid workers in Canada.

In some of the manufacturing industries, workers may be temporarily protected by investment in Canadian plants, but, as these age and are outmoded by new plants built in low-wage areas of the world, many women here will be out of work. Ontario jobs will be threatened. In resource-based industries, workers have more protection, but, even here, goods must trade on an international market, and much of the processing work can be moved to low-wage countries. In both areas, research and development could make these areas more productive, but this would depend on greater investment not only in research but also in education (Premier's Council, 1988).

There are also contradictory tendencies in terms of the scale of production. "On the one hand, the model of highly specialized mass production in increasingly globalized markets is seen as the path to greater exploitation of economies of scale, in an increasingly impersonal multinational organization of production. On the other hand, the model of flexible, custom-packaged specialized production is seen as feasible, with improved exploitation of economies of scope in knowledge and design, with greater reliance on community structures" (Institute for Research on Public Policy, 1989: unpaginated). The first tendency would lead to more jobs in the assembly-line mould, with less control for each country, each province, each region, and each individual. The second tendency would permit greater control within the country and create the possibility for better jobs, but it would require investment in education, training, and development.

Report after report has concluded that Canada's future in this new global economy will depend to a large extent on the education and skills of our population. The Report of the Premier's Council (1988: 13) argued that "[I]t is in the support systems of an advanced industrial economy that the basic abilities, specific skills, and ideas of its people will be developed. We must pay more attention to this human infrastructure in Ontario." The Canadian Council on Social Development (1988: 36) maintained that the "high-wage nations of the future are likely to be those that export knowledge services, either directly as designs or indirectly as embodied in commodities." And the Institute for Research on Public Policy (1989: unpaginated) drew the following conclusion from their examination of the service sector: "Comparative advantage in the international trading system is likely to reflect the extent to this knowledge base, the growth of human capital endowments, and the effectiveness of these organizational arrangements with the labour force."

Ontario's current labour supply could provide exactly the edge we need in the new global economy. We have people who understand the cultures and languages of all major trading nations. By offering the opportunity to further develop their education and training, these people could become a major resource in establishing Ontario's place in this emerging world order.

The Restructuring of the Ontario Economy

When thinking about the impact of the global economy, it is probably appropriate to think of the future as now. Fundamental changes have been taking place in the Ontario economy. Massive, and rapid, restructuring is already under way.

The most obvious change has been the shift from goods-producing to service-producing industries. With the exception of agriculture, jobs in all Ontario industrial divisions have been growing throughout the 1980s. But they have been growing at very different rates. Between the 1981 and 1986 Censuses, the service sector industries grew more than three and a half times as quickly as the goods-producing industries. Indeed, three times more jobs appeared in the community, business, and personal service industries alone than in the combined total of job growth in agriculture, forestry, mining, fishing, manufacturing, construction and transportation. Job growth in trade almost equalled that of the total growth in the goods-producing industries (calculated from Statistics Canada, 1988e).

"Much of the growth in services actually comes from the process of reorganization of industries and firms which have been going on for some time. Manufacturers have shown a tendency to shed service functions once performed by their own employees and instead have purchased the same functions from newly formed outside firms offering the specialized services they require" (Gertler, 1988: 68). The development of these firms that provide services to the goods-producing sector reflects in part the need for people with more specialized education and training and more experience in particular aspects of the work.

Moreover, as the Labour Market Research Group in the Ministry of Skills Development (1988: ix) has pointed out, the slower employment growth in the goods-producing sector "reflects substantial productivity gains as output rises" and not a decline in the importance of this sector. Much of the strength of the service sector continues to depend on the goods-producing industries. These gains in productivity are based on both the introduction of new technology and the increasing skill levels of the workers. Many of the jobs that are disappearing in the goods sector require little education and training. Since 1981, "there have been declines in the absolute number of workers in many blue-collar occupations such as processing, machining, or fabricating, and even greater falls in relative terms." (Quarterly Labour Market and Productivity Review, 1988: 18). Meanwhile, there is a shortage of workers to fill many of the skilled jobs that remain and in many of the other jobs previously defined as unskilled, there has been "a significant increase in the percentage of jobs requiring one or more years of specific vocational preparation" (Quarterly Labour Market and Productivity Review, 1988: 19). These shortages reflect private-sector employers' reluctance to undertake the long-term training programs that are required (Ministry of Skills Development, 1988: viii).

Within the service sector, there has been substantial growth in those occupations that involve advanced levels of education and training. The most rapid growth has been in managerial, administrative, and related occupations, followed by service jobs, clerical and sales work, medicine, teaching, and social science work. While these large categories are extremely varied in terms of the knowledge and skills that are necessary to do the work, it is clear that the majority of these new jobs require functional literacy and at least some post-secondary education and training.

The two occupational categories which experienced the largest growth serve to demonstrate the restructuring, the variety within groups, and the overall rise in demand for skilled workers. About 92,500 jobs were added in the managerial, administrative, and related job classification in Ontario between 1981 and 1986 (calculated from Statistics Canada, 1988e). Not all these jobs were in high-paying managerial work that required graduate courses in management techniques. Of the new jobs in this category, about 28,250 were in "occupations related to management and administration," while another 12,600 were "other managers and administrators, not elsewhere classified" in the service, and trade industries and in unspecified industries (calculated from Statistics Canada, 1988e: Table 2). Included, therefore, are those, for example, who are administrative assistants in offices or who operate drop-in centres and retail outlets. Almost three-quarters of those filling these kinds of new managerial, administrative, and related jobs are female. Some of these jobs call for few formal qualifications, but most require people to keep reports, handle money and have interpersonal skills. Increasingly, they involve formal preparatory courses and the use of computers. Furthermore, the content of jobs in this category is rapidly changing, and many of those who work in these jobs can look forward to retraining several times during their careers.

Similarly, the second largest job growth was in service work. Almost 64,000 additional service jobs appeared between 1981 and 1986 in Ontario (calculated from Statistics Canada, 1988e). These jobs were among the least likely to have formal education requirements, although there were contradictory tendencies within this large occupational group as well. Included in this category were people who prepare and serve food; those who provide personal service in beauty shops, airplanes, and funeral parlours; those who clean buildings and clothes; and those who offer protective services. One of the occupations in this classification with the fewest formal requirements is the chambermaid and houseman category, where jobs actually declined between 1981 and 1986. At the same time, however, jobs in the food preparation occupations grew rapidly, and, although some, such as chef, require years of training, others take very little time to learn and do not require literacy.

In addition, jobs within this category that previously had few formal qualifications increasingly have entrance requirements that include basic education and formal training. Homemakers and babysitters provide just two examples. Women with little if any formal training have long done this work, but more and more are taking college courses to upgrade their skills, and more employers are giving preference to those with formal preparation. And, finally, many of the jobs in this category are very insecure. Formal education and training could help both improve the work and increase the security of workers in this sector while increasing their career options. Judging from a Study Team 2 focus group, the hospitality industry, for one, recognizes the connection between better training and its capacity to attract the stable career-oriented workforce needed in this fast-growing industry (Gill, 1989).

In both the goods-producing and service-producing sectors, there has been an increasing concentration of ownership at the same time as there has been an expansion in small business. Indeed, small business has been responsible for most of the employment growth in recent years, albeit often in forms that are dependent on contracts with large private and public enterprises. Development has been increasingly concentrated in urban centres as well. Accompanying these trends has been the steady growth in part-time, short-term, and contract work. More and more people hold more than one job. All these factors mean that jobs are increasingly insecure, and that many people can look forward to a number of different jobs throughout their lifetimes. They will need to be able to learn quickly how to perform these different jobs.

This massive shift into the service sector, then, has meant the creation of both skilled and unskilled jobs, as those terms are traditionally used. And it is women who are disproportionately segregated into those classified as unskilled. Although a large number of jobs requiring little formal training have been created, "the shift to employment in service appears to have led to a general upgrading of the skill requirements for the economy as a whole" (Myles and Eno, 1989: 2). Even jobs that were assumed to need little formal preparation are increasingly attached to specialized courses and assume basic education. Less than half the current jobs require some post-secondary education, but the de Grandpre Advisory Council has predicted that almost two-thirds of the jobs created between now and the year 2000 will do so (Advisory Council on Adjustment, 1989: 24). On the basis of their research, the Labour Market Research Group in the Ministry of Skills Development (1988: xi) concluded that: "Despite some evidence of deskilling of jobs, the strong consensus among employers is that workers will need more skills and more training to achieve proficiency in their jobs. There is also a strong consensus that good basic skills in reading, writing and mathematics, and in interpersonal relationships are becoming much more important for workers, who must cope with the new technologies."

New Technologies

New technologies are integral to both globalization and restructuring. There is a great deal of debate about the precise consequences of new technologies but there is general agreement that they will transform the content, organization, and location of work. Moreover, it is generally agreed that the greatest impact will be on women's work, although few, if any, jobs will remain untouched (Armstrong, 1984; Menzies, 1981; 1982). Hard product and process technologies have already begun to automate clerical and service work in addition to goods production work. In some cases, jobs have disappeared as wordprocessors replace file clerks, and robots replace assembly-line workers. In others, jobs now require less skill. Typesetters, for example, no longer set type; they work at typesetting machines. New jobs have been created and many of the old ones now involve different skills. This new equipment alters "both the specific technical skills and the more basic general skills that workers must have" (Ministry of Skills Development, 1988: x).

Technologies have also begun to change the way work is structured and controlled. The new technologies can offer greater control over the work process and more precise machine-recording of speed or volume. These capabilities reduce the need for supervisors and increase the possibilities for working in remote locations or at odd hours. Homework is easier to organize, and support services in rural areas can be eliminated as centralized services provide the necessary information and analysis. Because they can greatly simplify the problems of scheduling, hiring, supervising, and paying part-time workers, new technologies encourage the hiring of more part-time and short-term workers. They can also alter how workers relate to each other and the way work gets done. For example, quality circles could replace assembly lines, and multiskilled teams could transform the typing pool. All these processes serve to eliminate or alter jobs. And the work that remains has different general skill requirements.

We are only beginning to see the impact of the new technologies. Few organizations have reached the stage of the automated office or the fully robotic shop floor. This next step will mean even more rapid transformation, more dislocation. The need for retraining will increase. So will the need for more general education and skills, because few people will stay in the same job or with the same employer for life, and those who do will find the work constantly changing. Education and retraining will have to alternate with paid work or be an integral part of paid work. As is the case with restructuring, the new technologies create contradictory tendencies. They deskill some jobs while creating more highly skilled jobs. They offer a greater choice in location and hours while centralizing some work in urban centers and creating shift work. They offer both more control and the possibility of being more controlled. The outcomes are not predetermined. What is clear is that those with education and training will have more choices to make. Under current conditions, those with the fewest choices will be women, the disabled, older workers, the poor, the visible minorities, the Native Peoples, and recent immigrants. Especially with new technologies, the benefits of greater investment in education and training are not restricted to the individuals involved. By expanding educational opportunities, Ontario will have more choices as a province to make.

The Public Policy Context

Governments play a central role in structuring today's economy. A wide range of both federal and provincial policies and programs has an impact on the demand for labour. Government policies and programs also have an impact on labour supply and on the preparation of labour.

Immigration Policy

Although immigration has slowed throughout the 1980s, immigrants continue to be a major source of labour supply. Canada's immigration policy reflects social, political, and humanitarian concerns, but the regulations have historically placed primary emphasis on the need for specific kinds of labour. The point system currently in place is designed to ensure that priority is given to those with specific vocational preparation, experience, arranged employment, education, and knowledge of an official language. But in two of the three major categories of applicants, these points are not the major factors considered. The criteria based on labour demand and employability apply most consistently to those in the Independent Class category. These are the people who are least likely to need basic education and literacy programs. Of course, they may find that the demand for their skills or their promised job disappears after they arrive, making it necessary to retrain in another field. Assisted relatives who do not fit into the Family Class are also included in this category, and they are eligible for ten bonus points. This reduces the importance attached to the other criteria related to employability and makes it more likely that this group will need some education or basic official language literacy courses. Entrepreneurs and investors also fall into this group, and recent regulations which give priority to investment and the development of new business may mean that many who enter under this category do not fit the other criteria of employability and language proficiency. These people too may require some educational services in order to conduct their businesses in Canada.

Those who come in under the Family Class are sponsored by a relative who is at least 18 years old and who is a resident of Canada. Under this provision, spouses, children, parents and grandparents may enter Canada without having the points necessary for those in the Independent Class. The sponsor promises to provide maintenance for a period ranging from one to ten years. As Seward and McDade (1988: 19) have pointed out, there is an important benefit to this policy. It "facilitates the immigration of many persons — particularly women with lower education or skills — who might not qualify if assessed under the point system." On the other hand, these women are not eligible for the basic language training allowance offered to other immigrants. Given their need for income, they are thus forced into the narrow range of vulnerable jobs in those low-paid service or manufacturing sectors in which official language proficiency is not required.

The third category consists of Convention Refugees and Designated Classes. Although the people who are escaping from intolerable situations in their home country are assessed in terms of the point systems criteria, these criteria are merely used as guidelines for admittance. Consequently, many enter without basic English or French language skills, with skills that are not in demand, or without the papers proving their credentials. Many, therefore, may require upgrading or basic education and language courses.

The proportion of immigrants who have entered under the Family Class and Convention Refugees and Designated Classes has been increasing throughout the 1980s. This means that if these immigrants are to fill the demand for labour, more basic education and language classes, as well as skills training, will be required.

Canadian Jobs Strategy and the Ministry of Skills Development

The federal government's Canadian Jobs Strategy includes six programs: Skill Investment, Skill Shortages, Job Entry, Job Development, Community Futures and Innovations. The Skill Investment programs are designed to help workers whose jobs are threatened by technological or market changes, while the Skill Shortages programs provide support for employers who have difficulty finding workers with the appropriate skills. The Job Entry programs offer up to three years training and/or work experience for those who have been out of the labour force, and the Job Development programs are intended to use work experience and training to improve employment possibilities. Community Futures is directed at small businesses outside major urban areas and, therefore, does not necessarily have training implications. Innovations offers support to individuals and groups who develop strategies to improve the functioning of the labour market. These may involve education and training.

According to the Ontario Ministry of Skills Development (1989: 8), "[U]nder the CJS, the federal government funds adult and apprenticeship training courses, and supports some on-the-job training. The primary focus of the CJS has been assistance for the long-term unemployed, although it does provide some funding for the upgrading of workers' skills." This report goes on the express concern about the "declining commitment to skills training as an economic investment and an erosion of the established training infrastructure" (1989: 10), the drop in the number of participants, the priority given to the long-term unemployed "over training for workers and recently displaced workers" (1989: 14), and the reduction of support for French language training.

Others, too, have raised concerns about both the funding and the structure of current federal-funded programs in this area. A paper prepared for the Canadian Advisory Council on the Status of Women (McKeen, 1987: i) pointed to the underrepresentation of women, to eligibility criteria that excluded, particularly, immigrant women, to training that served to perpetuate, rather than eliminate, women's segregation in the labour market, and to the specificity of training which meant that skills were not portable to other jobs. A report commissioned by the Canadian Congress for Learning Opportunities for Women (Wismer, 1988: 8) concluded that "lack of child care, lack of money, lack of information regarding the availability of programs, geographical isolation, and a lack of good fit between the program structure and the needs of women who might enrol" serve to limit women's participation in these education and training programs.

There is an enormous range of training programs offered by all three levels of government and it is impossible to outline them all here. Surveys of these programs reveal their complexity and their inadequacy for current labour-market conditions. Yalnizyan and Wolfe (1989: 76) summarize the major problems: "1) the trends towards privatization and underfunding of the training system; 2) the inadequacy of available information concerning training opportunities; 3) the lack of coordination in training initiatives both within the public sector and between the public and private sectors; and 4) the issues of eligibility for and accessibility of programs."

Although all levels of government have acknowledged the critical importance of basic and long-term education and training in adjusting labour to new market conditions, these policy inclinations have not been sufficiently translated into practice. And although all levels of governments have recognized that some groups are particularly disadvantaged in the market and, as a consequence, have targeted some training programs for them, these programs are far from equally accessible to all. Moreover, both the federal and provincial governments have emphasized the role to be played by private industry in training and have argued that its role should be increased. Yet, a recent study by the Ministry of Skills Development (1988: 28) "found that only approximately 20 per cent of establishments in Ontario provide formal qualifying and upgrading training programs aimed at providing their employees with skills to meet the requirements of a job. This finding raises a fundamental concern about the adequacy of the volume of employer-sponsored training to meet industry's own needs."

It is becoming increasingly clear that if governments are to fill what they have defined as a need for more basic education and training, more skills development and language education, then they must turn to the colleges to fill much of this need. Employers cannot be expected to meet many of these basic needs; they face an enormous challenge in providing job-specific training. The unanimous view emerging from the Study Team 2 consultation process is that employers "want to recruit people who already have 'reading, writing, and arithmetic' skills, who are well-rounded and understand something of the economy and political structures of our society" (Gill, 1989). Adults, meanwhile, cannot normally be expected to return to a secondary school setting, even if they had once been successful there.

Free Trade

While there has been a great deal of debate about the precise consequences of the Free Trade Agreement, there is a general consensus that jobs will disappear, and the economy will undergo significant restructuring. The Ontario Government estimated that 281,000 jobs are threatened in this province alone (Cameron, 1986: 121). Although the Federal Government has never denied that some jobs will be lost, it has contended that new and more highly skilled jobs will appear. "Better jobs are created when companies are confident about the future and are prepared to restructure to remain competitive" (Department of External Affairs, 1986: 12).

While there is also debate about which jobs will grow and which will disappear, few have disputed that women's jobs will be hardest hit. As Cohen (1986: 144) made clear, "The cost of free trade will be very high for women because women work in the very manufacturing and service industries that are the most vulnerable in a free trade market." The women, and the men, who work in these sectors are precisely the ones with the fewest recognized skills, the most limited mastery of English or French, and the lowest levels of formal education. They are also the most likely to be underrepresented in long-term training programs (Cohen, 1986: 145).

The jobs that are predicted to grow are primarily in the service sector. Those who favour free trade have argued that these service jobs will involve high technology and will require advanced skills. Those who oppose the Agreement argue that a large proportion of the new jobs will be low-paid and vulnerable service jobs, although most will involve dealing in at least one of Canada's official languages.

In his analysis of the recent provincial budget, Maslove (1989: 17-18) has argued that the Free Trade Agreement may restrict the "economic development and adjustment policies" of both levels of government. As a consequence, provincial governments may have to rely more heavily on programs such as education and training to influence economic development.

Whether the proponents or the critics of Free Trade prove correct, each scenario means that there will be an increased demand for retraining, for basic education, and for literacy skills. Tariff reductions through GATT agreements and other trade developments will also expose especially the manufacturing sector to international competition and serve to increase dislocations and the demands for retraining as well (Ministry of Skills Development, 1988: x).

Employment and Pay Equity Programs

Both the federal and provincial governments have employment equity programs in place. At the present time, these programs are voluntary. However, according to a Ministry of Citizenship document made public by the leader of the Ontario New Democratic Party, "[T]here is a growing evidence that voluntary employment equity does not work, but regulatory structures do" (Ferguson, 1989: A12). The report has led to increased pressure for employers to set targets related to the hiring and promotion of women, disabled persons, Native Peoples, and visible minorities. The City of Toronto now uses contract compliance as a means of encouraging employers who want contracts with the City to demonstrate that they have developed employment equity practices.

Ontario already has Pay Equity legislation in effect which requires all public and private sector employers with 10 or more employees to develop pay equity plans. The Pay Equity Act is based on the assumption that there is systemic discrimination which has served to undervalue women's work in the labour force.

These programs do not require employers to hire workers who are not qualified to do the work. Nor do they require employers to pay other than a comparable wage. There is evidence to indicate that there are many people within each of these target groups that have the requisite skills. However, there is also evidence that those within these groups have not only faced discrimination in terms of hiring, promotion and pay, but also in terms of gaining access to higher education, to skill development, and to language programs. Both kinds of legislation mean that it is in our economic interest to ensure that members of these target groups have every opportunity to develop their skills and retrain when the skills they already have are no longer in demand.

These four major areas do not, of course, exhaust the list of government initiatives that influence the supply of and demand for labour. They are, however, indicative of the kinds of policy development to which current and potential workers, and the colleges that would serve them, must adjust. These immigration, training, trade, and equity policy choices reflect and reinforce the pace and direction of economic change. Together, they mean that more and more jobs will require the basic literacy training and the education that permit the application of information to a wide range of tasks (Wolfe, 1989), which in turn means that greater access should be provided to the colleges.

When employers offer training, they tend to prepare workers for very specific tasks in their particular enterprises. When these jobs disappear, workers can once again find themselves without the basic skills that are in demand. Most employers prefer to hire those who already have the demonstrated capacity to learn quickly the required specific skills. Employers facing cutbacks or relocation in particular have little interest in investing in long-term basic training. It makes economic sense to have public educational institutions, which have the experience and the facilities, offer basic education and literacy skills, as well as training in broadly based trades and professions.

More specifically, it makes economic sense to utilize more fully the 22 (soon 23) colleges. These colleges are spread across the province at the 90 or more relatively accessible campuses in which we as a society have already invested heavily. They accommodate the career-oriented needs of adult, lifelong learners with part-time, short-burst and off-hour offerings as well as conventional, full-time offerings. They generally maintain close contact with the communities they serve. The challenge is to build on their current accessibility and community ties in order to meet Ontario's changing economic requirements for the future.

Concluding Remarks

What has become increasingly clear is that education and training will become more important for both individuals and the economy as a whole. Without a population with a broad general education that can provide the basis for the development of new skills, Ontario cannot hope to be a full participant in the emerging global economy. Only with a highly educated population will we have choices to make about the direction and consequences of the restructuring process that is already under way. Only with a highly educated population can we influence the impact of the new technologies and avoid the worst predictions. Only with programs designed to ensure access for women, the disabled, old workers, the poor, visible minorities, Native Peoples, and recent immigrants can we keep our commitment to equality and fill our labour force needs of the future.

Education and training can be provided in a variety of locations by a variety of organizations. Employers can offer useful on-the-job training and skill development. They should be encouraged to do so in ways that ensure broad participation by disadvantaged groups. But employers have proved reluctant to undertake long-term and general upgrading programs of the sort necessary to provide people with transferable skills. Especially as firms merge and disappear, employers will not be willing or able to offer the necessary basis for new or other jobs. Community agencies, including unions, can also perform a useful role by offering courses and counselling as well as advice to those organizing college courses. In many ways, they are particularly suited to the provision of initial services for disadvantaged groups. Community agencies are, however, necessarily limited in resources and in the range of programs they can mount.

Colleges are well placed to provide a broad range of general education, generic skills, and career-oriented programs, including retraining programs, in ways that are sensitive to both community and province-wide requirements. With the advice and assistance of employers and community agencies, colleges could do much to meet the growing need in a prosperous and fair Ontario for a highly educated and highly skilled labour force. In order to help meet this need, colleges will have to ensure that individuals from all segments of Ontario society enjoy equitable access to their programs. We need to tap the full potential of all Ontarians as we prepare for the economic challenges of the next century.

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Colleges
and the
Changing Economy

Background Papers

Audrey Gill
Rapporteur

Role of the Colleges in the Changing Economy
Report on Consultations

Study Team 2

Role of the Colleges in the Changing Economy
Report on Consultations

Summary

Study Team 2 undertook a consultation process with selected employer and employee representatives from across Ontario, to seek their views on the economic role of the community colleges.

Common points arose in each of the 12 'focus groups,' and other points were raised frequently or emphasized strongly.

1. GENERAL COMMENTS

- The changing economy requires more highly qualified workers
- The workforce is not well enough educated and trained; therefore, there are serious shortages of skilled labour
- Positive attitudes towards lifelong learning are needed
- Mobility in the workforce and flexibility in education and training is needed
- A coordinated approach among educational institutions, governments, employers, and employees is recommended to solve these problems.

2. COMMON THEMES

The degree of commonality on the key issues was extensive and indicated the following three common themes:

a) Generic Skills

- Every group strongly expressed the need for better general education and skills training — termed 'generic skills'
- These skills include written and oral language skills, numeracy skills, interpersonal skills, and general technical skills; as well as the ability to think, to learn, to analyze and to problem-solve.
- The publicly funded colleges should be responsible for teaching these portable skills
- Employers should take responsibility for job-specific training — which could be provided by colleges but funded by employers
- It is essential that workers have the ability to be trained and retrained.

b) College-Wide 'System'

The need for a college-wide coordinated system was identified in order to respond to issues consistently across the province. Some of the issues identified were:

- Common standards to assist employers in recruiting are needed
- Common credentials are needed for the same reason, and to give value to students' knowledge
- Greater transferability of credits, both between universities and colleges and between individual colleges are required

- Improvement of opportunities for disadvantaged groups, for which the colleges have a social responsibility are needed
- Upgrading/retraining/teaching adults requires some different approaches in teaching and flexibility in courses
- Cooperative work/study programs, carefully managed, are encouraged
- Planning of educational needs with various business sectors is recommended

c) Public Education

- There is strong support for the colleges to remain as public institutions
- Employers say they have to take more responsibility for training but want to work closely with the colleges
- Trade unions and community groups say that education should be 'learner-driven'

3. OTHER ISSUES

Several other issues were raised frequently, often with emphasis:

- College teachers need more workplace experience
- Confusion between federal and provincial jurisdictions needs to be sorted out
- Employers would like the rigidity between colleges and universities broken down; the unions like the colleges as distinct institutions
- Accessibility must be improved through, for example, better financial support, services, attention to special needs
- The image of blue-collar work should be improved and the colleges can help
- Employers and employees are eager to consult on program and course development
- Francophones have special needs, including measures to encourage higher participation rates in post secondary education
- Northerners have special needs, mostly arising from a different population mix and the vast distances of the North
- Trade unions and community groups believe the needs of students for portable skills and reduced barriers should take precedence over job-specific needs of employers
- Applied research, which is mutually beneficial to the colleges and economic growth, should be looked at.

Le rôle des collèges dans une économie en pleine évolution
Rapport sur les consultations

Sommaire

L'équipe de travail 2 a entrepris un processus de consultation auprès d'un certain nombre de représentants d'employeurs et d'employés sélectionnés des divers coins de l'Ontario pour connaître leur point de vue sur le rôle économique des collèges communautaires.

Certains points ont été soulevés par chacun des douze groupes formés aux fins de consultation, alors que d'autres étaient mentionnés fréquemment ou avec une grande insistance.

1. GÉNÉRALITÉS

- L'économie en pleine évolution a besoin de travailleurs de plus en plus qualifiés.
- Le niveau d'éducation et de formation des travailleurs est insuffisant.
- Il en résulte une importante pénurie de main-d'oeuvre qualifiée.
- Le développement d'une attitude positive face à l'éducation permanente est nécessaire.
- La mobilité de la main-d'oeuvre et une souplesse accrue en matière d'éducation et de formation sont nécessaires.
- Pour résoudre ces problèmes, la méthode recommandée consiste à coordonner les efforts des établissements d'enseignement, des gouvernements, des employeurs et des employés.

2. THÉMES COMMUNS

Un consensus très clair s'est établi autour des questions-clés et trois thèmes communs se sont dégagés.

a) Connaissances de base

- Chaque groupe a exprimé de fa(on très nette le besoin d'une éducation et d'une formation de base plus poussées, c'est-à-dire, de «connaissances de base» plus solides.
- Parmi ces connaissances, on compte celle de la langue écrite et parlée, celle du calcul et les connaissances techniques générales, la capacité de réfléchir, d'apprendre, d'analyser et de résoudre les problèmes et enfin, les compétences en matière de relations interpersonnelles.
- C'est aux collèges publics que devrait revenir la responsabilité de transmettre ces connaissances de base.
- Les employeurs devraient se charger de la formation spécifique aux emplois qu'ils offrent, laquelle pourrait être dispensée par les collèges mais financée par les employeurs.
- Il est de la plus haute importance que les travailleurs soient aptes à être formés et recyclés.

b) «Système» s'étendant à tous les collèges

Le besoin d'un système coordonné s'étendant à tous les collèges pour permettre un traitement uniforme c problèmes existant à l'échelle provinciale a été établi. Parmi ces problèmes, l'on compte:

- le besoin de normes uniformes pour faciliter le travail de recrutement des employeurs;
- le besoin de certificats uniformes, pour la même raison et aussi pour conférer une valeur plus claire aux connaissances acquises par les étudiants;

- le besoin de crédits plus facilement transférables, tant entre les collèges et les universités qu'entre les collèges eux-mêmes;
- la nécessité d'une amélioration des chances offertes aux membres des groupes désavantagés, envers lesquels les collèges ont une responsabilité sociale;
- le fait que l'enseignement aux adultes, leur perfectionnement et leur recyclage nécessitent des méthodes d'enseignement différentes et une grande souplesse dans le contenu des cours;
- la nécessité d'encourager la création de programmes coopératifs d'enseignement par alternance et de les administrer avec soin;
- la nécessité de planifier les besoins en matière de formation en collaboration avec des représentants des divers secteurs de l'économie.

c) Éducation publique

- Il existe un consensus très clair à l'effet que les collèges devraient demeurer des établissements publics.
- Les employeurs disent devoir assumer une plus grande part de la responsabilité en matière de formation mais désirent travailler en étroite collaboration avec les collèges.
- Les syndicats et les groupes communautaires affirment que l'éducation devrait d'abord être axée sur les besoins des étudiants.

3. AUTRES QUESTIONS SOULEVÉES

Plusieurs autres questions ont été soulevées fréquemment, souvent avec insistance:

- les enseignants des collèges devraient acquérir une plus grande expérience des milieux de travail auxquels leurs étudiants se destinent;
- la confusion qui règne entre les juridictions fédérale et provinciale doit être éliminée;
- les employeurs voudraient que la distinction rigide qui est faite entre les collèges et les universités soit abolie; les syndicats préfèrent que les collèges demeurent des entités distinctes;
- l'accessibilité aux collèges doit être accrue par l'entremise de mesures telles qu'un plus grand soutien financier, une attention plus grande aux besoins particuliers, etc;
- l'image du travail effectué par les «cols bleus» doit être rehaussée, ce à quoi les collèges peuvent contribuer;
- les employeurs et les employés seraient très heureux de pouvoir se consulter quant à l'élaboration des programmes et des cours;
- les francophones ont des besoins spéciaux. Ils ont entre autres besoin de mesures visant à encourager un taux de participation plus élevé de leur part aux programmes d'études postsecondaires;
- les habitants du Nord ont des besoin spéciaux, résultant surtout d'un mélange ethnique différent et des vastes distances existant dans cette partie de la province;
- les syndicats et les groupes communautaires considèrent que la priorité devrait être accordée aux besoins qu'ont les étudiants d'acquérir des connaissances transférables et à la réduction des barrières plutôt qu'à l'acquisition des connaissances spécifiques requises par les employeurs;
- la possibilité d'effectuer des recherches appliquées qui seraient profitables à la fois aux collèges et à l'économie dans son ensemble devrait être étudiée.

Table of Contents

Page

I. Introduction 1

II. Some Definitions 2

III. Summary of Results 2

- 1. General Comments 2
- 2. Common Themes 2
- 3. Other Issues 4

IV. Reports on Each Session 7

- Focus Group #1 — Manufacturing Sector 8
- Focus Group #2 — Public and Non-Profit Sectors 10
- Focus Group #3 — Industry 12
- Focus Group #4 — Information and Communication Technologies 14
- Focus Group #5 — Associations 16
- Focus Group #6 — Social Service Agencies 18
- Focus Group #7 — Trade Unions 21
- Focus Group #8 — Financial Sector 23
- Focus Group #9 — Hospitality Sector 25
- Focus Group #10 — Construction Trades Employers 27
- Focus Group #11 — Francophones in Business 29
- Focus Group #12 — Northern Region/Resource Sector 31

I. Introduction

Broad-based consultation is a key part of the Vision 2000 project. As part of their work, Study Team 2 sought the views of employers and employees regarding the economic role of the community colleges in Ontario.

Method:

Twelve groups of selected employer and employee representatives were created, mostly by sector, for the Study Team 2 consultations (see page 10 for list). Representatives from as broad a range as possible in each sector were placed in a 'focus group' setting to foster round-table discussions of their expectations and needs from the colleges — to discover the views of sectors, firms, and employees on certain key policy dilemmas.

Representation:

A broad-based and widely representative sample of employers in Ontario was consulted. The firms ranged in size from very small (eight employees) to small (from 20 to 300 employees), and medium-sized (from 300 to 2,000 employees) to large (5,000 to 10,000), and very large (40,000 employees in the case of General Motors).

The employers who participated were drawn from the public (crown corporations and the civil service), private (for-profit and non-profit), and cooperative sectors. All together, the firms consulted employed more than 360,000 people directly. In addition, 13 employers' associations, representing more than 100,000 firms employing several million people, were consulted.

The union input was handled by the Ontario Federation of Labour which consulted about 15 unions and brought the consensus views forward to the Study Team. Representatives of organizations which assist workers with training and retraining also presented the employee point of view.

Although the intention was to provide sectorial representation in the groups, the consultations also provided for regional, linguistic, and functional/occupational representation as far as possible, given the Study Team's budget. As a result, the catchment areas for all 22 existing colleges were covered, either by college staff in attendance or by people who have direct dealings with the colleges. The new (23rd) Francophone college currently in the development stage was also covered well in the June 29 session.

Questions Considered:

The discussions ranged across the spectrum of issues involving the colleges and business and labour. Participants expressed their views of current college education and what could be done better to meet the needs of a changing economy. The changing skill requirements and who should meet these requirements (business, colleges, universities); the relationship between colleges and business; the role of the colleges in labour-market planning, in retraining, in overcoming inequity in the labour market, and in meeting social objectives; and issues such as poaching, rapid technological change, funding, and specialization were all discussed.

The Report:

In this report on the consultations, first we present a summary of all 12 groups, pulling together common themes and points which were emphasized, followed by individual reports on each session.

II. Some Definitions

"Generic"

In this report, we use the term "generic" to describe participants' expression of the need for general education and skills training. Many terms were used to cover literacy and numeracy skills, the ability to think, to analyze, to problem-solve, to continue to learn throughout a lifetime. Participants did not mean to say there should be actual courses such as "Problem Solving 101" or "Thinking 202" — rather, that these skills and abilities must be an important element in all courses and developed while in the educational setting. The term generic is used to describe general technical skills as well — for example, basic computer skills, which are needed both to learn and to enter the workforce.

"Education" and "Training"

Since there is debate in education circles on the correct use of these two terms, we are indicating our usage. In general, this report uses "education" to mean broad knowledge and the generic education referred to above; and "training" to mean development of skills for the express purpose of bettering the individual's position in the labour market. "Generic training" means the skills are portable, rather than job-specific.

III. Summary of Results

1. GENERAL COMMENTS

There is a clear recognition that a skilled workforce is key to Canada's competitiveness and growth.

Employers strongly and urgently stated that our workforce is not well enough educated or trained, and that Canada, therefore, faces serious shortages in skilled labour.

We need more highly qualified workers than in the past, and this will continue to grow with the fast-changing economy. Industry is experiencing global competitive pressures and is trying to move quickly on the new technologies' side, but many workers cannot keep up because they are not trainable.

Participants said educational institutions, beginning in Grade 1, have to understand this major shift and begin early to inculcate positive attitudes towards lifelong learning. The changing economy also demands mobility in the workforce, and flexibility in education , training, and in the institutions themselves.

A coordinated, integrated approach to solving these problems — involving educational institutions, governments, employers, and employees — is strongly supported.

2. COMMON THEMES

Employers articulated clear and urgent needs from the colleges. Unions and community groups made similar points from the employees' perspective. The degree of commonality on the issues was extensive — raised by every sector — employers and employees.

The common points made by all indicate three central themes arising from the consultations: The need for generic skills; the need for a college 'system'; and strong support for the colleges as public institutions.

a) Generic Skills

The unanimous view, from every sector, is that generic knowledge and skills are lacking in young people coming out of the high schools, colleges, and universities.

Employers need graduates with written and oral language skills, numeracy skills, interpersonal skills, general technical skills; as well as the ability to think, to learn, to analyze and to problem-solve.

Employers want people who are able to learn — they want to recruit people who already have "reading, writing, and arithmetic" skills; who are well-rounded and understand something of the economy and political structures of our society; and who are able to continue learning.

As well, employers are finding a lack of interpersonal skills — of the ability to work in teams, understand workplace structures, and take responsibility and initiative.

Participants think the colleges, as publicly funded institutions, should be responsible for teaching these portable skills, and that employers should take responsibility for job-specific training — which could be provided by a variety of sources, including colleges, but funded by employers.

In other words, a blend of core communications, analytical, problem solving, technical and interpersonal skills are needed —with the ability to be trained and retrained.

Employers and employees alike say this knowledge is essential for labour market mobility, flexibility and employability — within one organization and across industries.

b) College-Wide 'System' Needed

The participants did not know that the colleges are 22 (soon, 23) independent crown corporations. It was assumed there is a province-wide 'system' which should be able to respond to the across-the-board problems identified by employers and students.

The theme that arose consistently, then, is the need for system-wide responses and coordination — expressed through needs for standards; credentials; transferability; links to high schools and universities; and, in order to meet their educational needs, more effective cooperation/ participation with employers, community groups, and trade unions.

There is frustration with the lack of common **standards**. Employers say recruiting is made more difficult because they do not know "what we are getting." Some tend to develop a relationship with one college and always look to those graduates — although even differentiating between teachers to determine the level of education received. Large employers who have requirements across the province have serious problems in determining qualifications of college graduates. This raised the need for commonly understood credentials, both to assist employers and to give a 'value' to the students' knowledge.

Participants also noted the need for far greater **transferability** — particularly among colleges, but also between colleges and universities. Those who have worked closely with a college in sector-specific training are particularly frustrated and look for core courses being offered across the province, with the student being able to transfer easily, without loss of credits, to a specialized program.

Another 'system' role identified for the colleges is assistance in providing the necessary skills to those people treated inequitably in the past — women, culturally diverse groups, and disabled people. Many participants believe the colleges have a social role in this area and an obligation to **improve opportunities for disadvantaged groups**. Employers need a greater supply of such people and believe colleges should target courses and activities to serve their needs.

The need for **upgrading/retraining/teaching adults** on a much larger scale was expressed by every focus group. Not all sectors are fully aware of the changing demographics — a dropping birthrate and aging workforce — but all expressed the urgent need for high quality labour.

Many employers are finding great difficulties in upgrading, since basic education is often lacking in the older workforce. Remedial work is needed, as well as different and flexible educational models. There is also a strong view that employers have to play a larger role here, such as providing educational leave, accessible on-site evening courses, etc. People must be able to move easily in and out of education and work. This, too, was viewed as requiring a 'system' response since the need is widespread through all sectors and all parts of the province.

Cooperative work/study programs are favoured, but only if they are carefully managed and structured to benefit both the student and the employer.

There was considerable interest in sector-wide planning of educational and skills training needs, which was also seen as needing to be undertaken with the colleges, as a coordinated group, working with employer groups.

c) Public Education Preferred

There is strong support for the colleges to remain in the public domain — along with the view of employers that they have to take more responsibility for training, and that they want to work closely with the colleges. Trade unions and community groups expressed the view that education should be 'learner-driven': That the needs of students for portable skills and the reduction of institutional barriers should take precedence over the job-specific needs of employers.

Throughout all 12 focus group sessions, the colleges were viewed as having an extremely important role to play in contributing to the economy, and that "of course they would remain as public institutions." The emphasis was on what the colleges and employers, together, can do better. Interestingly, no one raised the option of privatizing the colleges.

Several participants in various sectors were people who train — and some in the social services sector and public sector groups were representatives of non-governmental agencies whose sole purpose is to deliver training. These people, also, see a strong role for the colleges and believe they should complement, not replace, them.

There is, then, an across-the-board view that much more education and training is needed, and that all those involved should work together to achieve the more highly educated and skilled workforce needed for the economy of the future.

3. OTHER ISSUES

Several other issues were raised in many of the sessions, often with considerable emphasis, and they are summarized below.

a) College Staff:

Many participants mentioned that teachers, and especially counsellors, are too removed from the work world and must acquire a better understanding, which they can convey to students. (It was noted that high school counsellors do not know enough about the colleges to provide good career/education advice early on.)

It was suggested that teachers should have more actual work experience, in order to keep up with the pace of change, and several employers expressed interest in exchange programs.

b) Federal/Provincial Jurisdictions:

There is considerable confusion over federal/provincial jurisdictions in training, resulting in overlaps and gaps — particularly in funding, course offerings, and certification.

Many urged the governments to sort out who is responsible for what, both for financial reasons and for the sake of students who have difficulties finding their way through bureaucratic confusion. One group (#6) strongly recommended a centre to provide 'one-stop shopping' for students for information on education/training and financial assistance.

c) Colleges/Universities Relations:

The information sector session, particularly, spent considerable time on the question of which institutions can best provide the education and training these employers are looking for.

The strongly stated view is that the rigidity of institutions is damaging efforts to improve education. There was a strong call for increased flexibility and transferability of credits between the colleges and universities and between the colleges themselves — with consideration being given to credits for industry training.

Some like the Quebec CEGEP system where the colleges are feeders to universities; and it is believed the colleges can also provide post-university specialist programs. The unions prefer that the colleges remain as distinct institutions.

The financial sector session noted that financial planning courses are just beginning to be offered, and that an excellent opportunity exists for university/college linkages and portability of credits in this area.

d) Accessibility:

Accessibility and institutional barriers were discussed in several sessions. The question often relates to the portability of credits discussed in para (c) above, as well as to easing accessibility to education and training for culturally-diverse groups, for adult learners, and for poor students.

Better financial support, flexibility in programs, and better services — such as improved counselling information and child care — are needed.

Geographical accessibility is a problem which needs grappling with, participants thought. Many favour specialty centres and believe financial and living assistance should be given to help students to move away from home to take specialized courses.

e) 'Blue-Collar' Work:

The image of blue-collar work should be improved and the colleges can play a major role here. Employers are experiencing severe skilled labour shortages, much of which can be attributed to attitudes among teachers, counsellors and parents that a university education is the only way to 'get ahead.'

It is thought the colleges are suffering from being regarded as in 'second place' and as 'trade schools.'

Colleges can participate in changing these attitudes, especially by assisting with promoting learning as being lifelong, and the trades as being significant to economic growth, as well as providing satisfying careers.

f) Advisory Committees:

Employers and labour and community groups all believe it is mutually beneficial for the colleges to consult on program and course development.

Some participants have served on advisory committees, and views differ according to individual experiences, but there was a general encouragement to the colleges to strengthen advisory/consultation mechanisms.

This thought was also expressed in the context of better joint human resource planning among employers, employee groups, educational institutions, and governments.

g) Special Needs:

The Francophones and the Northerners experience difficulties not common to others. Both groups make points about the need for regional responsiveness.

There is concern about the low participation rate of Ontario's Francophones in postsecondary education and encouragement should be given, such as providing training courses on site at the workplace, and giving credit for "every investment made by students."

In the North, it is the vast distances and different (from the South) population mix which create special problems. Distance education is viewed favourably as one solution, and special counseling and courses to ease accessibility for Native peoples and Francophones are suggested.

h) Learner-Driven Education:

The trade unions and the community groups (focus groups #6 and #7) emphatically stated the concern that employers are increasingly dominating the colleges' programs and future plans, without enough regard for the needs of the learners. It is feared employers are too concerned with their own narrow, specific, training needs and not enough with issues such as portability and accessibility. Education, training and retraining needs to be of quality, broad, and foundational — with the colleges' clients the students, rather than the employers.

i) Applied Research:

Discussion of what kind, if any, applied research should be done at the colleges was not very focused. The question was not often posed directly and did not arise spontaneously, and it was evident that few employers have thought about possible mutual benefits.

Concern was expressed that applied research could distract from the "main mandate of teaching"; whereas the Francophone businesses are enthusiastic about joint research between local businesses and their college to help promote community development — in fact, the colleges could become a "motor of development."

IV. Reports on Each Session

Study Team 2 Consultations

	Sector	Date	Location
1.	Manufacturing	May 17	General Motors, Oshawa
2.	Public and Non-Profit	May 26	Massey College, Toronto
3.	Industry	June 6	GM, London
4.	Information	June 16	Centennial College, Toronto
5.	Associations	June 20	Humber College, Toronto
6.	Social Planning Agencies	June 22	Social Planning Council, Toronto
7.	Trade unions	June 26	OFL, Toronto
8.	Financial	June 26	Ryerson, Toronto
9.	Hospitality	June 28	George Brown College, Toronto
10.	Construction Trades Employers	June 29	Algonquin College, Ottawa
11.	Francophones	June 29	Algonquin College, Ottawa
12.	North and resources	July 4	Timmins

Focus Group #1

Manufacturing Sector

May 17, 1989, at General Motors, Oshawa

Participants:

Geoff Boole	Chair, Ottawa Carleton Industrial Training Committee
Wes Davey	Employee Relations Manager, General Foods Inc.
Des Newman	President, Cametoid Limited (aerospace)
Les O'Brien	Ontario Furniture Manufacturers' Association
Andrew Prior	Manager of Operations & Training, Dowty Equipment of Canada Ltd. (aircraft undercarriages)
Derwyn Sangster	Executive Director, Canadian Electrical and Electronics' Manufacturing Association
John Shaw	Manager of Employee Development, General Motors of Canada

[Sitting in and responding: Gary Polonsky, President, and Doug Tripp, Technology Faculty, Durham College; and Janet Mason, Ministry of Skills Development]

Facilitator:	Tim Reid, Ryerson
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller and Craig McFadyen
Host:	Tayce Wakefield, General Motors

Focus Group #1 — Manufacturing Sector

1. Qualities Needed in the Workforce

Workers have to be much more qualified than in the past — more specialized and technical knowledge is needed. "There is a crying need for more education after high school." They also have to be flexible and able to learn new skills throughout their working lives.

There was unanimity on the strong need for better generic skills — generalists who have learnt how to learn and to think (analyze and problem solve), with social skills as well. "The colleges should provide work skills and skills which allow them to continue to learn."

To understand that education is lifelong, and that they must be "capable of being trained," students' and workers' attitudes must change, .

Upgrading is proving to be a real problem because Grade 12 is needed even for the plant floor now.

The different educational requirements and approaches needed between the recent school leaver and the adult upgrading should be dealt with better.

Industry is coming to realize it has to take more responsibility for its workers in training and retraining and is looking for the most effective ways to do this — the colleges are seen as key.

2. The Relationship Between Industry and the Colleges

The participants are all strongly in favour of a closer relationship between industry and the colleges, and felt that there is a communications gap now — "The partnership between the colleges and industry needs redefinition," said one. And it must go both ways — that is, business has a responsibility to the colleges, as well as the reverse.

There cannot be a clear division between who should do what, because each industry has different needs. Hands-on training at the job site is needed in most programs.

The college teachers are often out of touch with the reality of the workplace, and two-way staff exchanges with industry should be frequent and regular as greater in-depth understanding is needed.

An interest in in-house training, with the colleges designing the courses and providing the instructors, was expressed. Employers think they should pay for this service.

Co-op programs were suggested as a good way of bringing industry and colleges closer together in understanding the needs of both, as well as of fulfilling the needs of students.

3. Areas of Specialization

An extensive interest in colleges specializing in especially their region's industry (for example, automotive at Durham) was expressed — although geographical access problems were noted as a concern.

"Human resource development is needed on a regional basis and on a sectorial basis."

The example was given of cooperation between the Ontario Furniture Manufacturers' Association, Conestoga College, and the provincial government on the establishment of a centre of excellence in woodworking. The close connections between faculty and the industry are already paying off for both.

Coordination with industry on up-to-date machinery was posed as a useful solution where the colleges cannot afford to buy the newest and most expensive equipment, but where industry could lend the colleges new machinery for training.

4. Applied Research

When asked, the participants were not enthusiastic about the colleges' undertaking extensive applied research. Some comments: "It distracts from their main mandate of teaching"; "It would have to be very closely related to their learning objectives." [**Note**: No definition of applied research was given: In the college context it means working directly with industry to learn how to do things better — "the organization as a laboratory." There was, therefore, a certain contradiction between the citing of the positive experience of the woodworking centre, which involves applied research, and the negative comments on applied research.]

5. Other Comments

- Certification is very confusing and difficult — criteria problems and transferability problems need to be sorted out.
- The federal/provincial jurisdictional divisions in education cause many difficulties, particularly with certifications, with business getting caught in the middle. The politicians must be pushed to come to a solution.

Focus Group #2

Public and Non-Profit Sectors

May 26, 1989, at Massey College, Toronto

Participants:

Sheila Antill	Human Resources, Women's College Hospital
Anna d'Orasio-Sgro	Victoria Day Care Services
Elspeth Hayworth	Dixon Hall Community Centre & United Way
Gary Hepworth	Human Resources, Credit Union of Ontario
Bob Newman	Training Officer, Toronto Transit Commission
Nimmi Pitt	Personnel, City of Toronto
Marc Robillard	Public Service Commission (federal government)
Bob Sherman	Staffing Policy Office, Human Resources Secretariat, Ontario government
Ray Sitton	Manager —Staffing, Ontario Hydro
Nancy Vertolli	Victoria Day Care Services
Facilitator:	Charles Pascal, Chair, Council of Regents
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller
Host, participant:	Lorna Marsden, Chair, Study Team 2

Focus Group #2 — Public and Non-Profit Sectors

1. The Quality of Current College Graduates and Future Needs

There was unanimous and strong opinion that current grads are lacking in generic skills, especially written and oral communications skills, as well as the social skills of being able to work with other people and deal with the work structure.

"The best grads are first rate, but the large percentage are not, and they are deficient in many skill areas."

Recruiting is difficult because of the wide discrepancy in quality between colleges and between individual teachers — clearly articulated exit standards are needed.

The Ontario Hydro case: They recruit a large number of new people each year, spending $100 million a year on training. They would rather buy it but have to do their own because colleges are not producing the level they need. The nuclear operator program is eight years and costs $3 million per student. Not willing to make that investment on just anybody, they test extensively for technically oriented people: 60% of high school graduates and 40% of college graduates fail Hydro's basic science and English tests. Hydro faces, therefore, a serious labour shortage — "a crisis." They would like to deal with a few colleges more intensely, but being a provincial crown corporation means politically they cannot pick favourites. In addition to technical orientation, they are looking for well-rounded people with community interests and the ability to continue to learn throughout their careers.

The outline of these problems brought agreement from other employers that they find the same problems in varying degrees. For example, daycare centres find excellent graduates in the field, but who lack any knowledge of how to run a business. The federal government tests show consistently poor cognitive skills in both university and college grads.

There is a strong need for more skilled women and culturally diverse graduates. More effort should be made to meet the needs of new immigrants who have problems due to their lack of familiarity with Canadian traditions and practices.

The counsellors in both high schools and college are faulted for being out of touch with the work world and not preparing students better for both future learning and work. The need for more consistent follow-up on placements was noted.

2. Who Should Do What?

"The colleges should give the basic education, and we'll train on the job."

This focus group showed a strong commitment to employers investing in human resource development. "Education support by employers should be the norm — Canadian business lags far behind in commitment to education."

But they want help, and they want much closer connections between the colleges and, in this case, public sector and non-profit employers.

Cooperative programs were viewed as good for both the employer and the employee (with the federal public service very enthusiastic about expansion of co-ops). The concept was also discussed as "partnership training" and "twinning." The difficulties of managing coop programs and the objections of unions were noted — although it was thought these problems can be ironed out if attitudes change and if the programs are structured and managed with care.

Consultation with employers on program development is very valuable — advisory committees range widely in effectiveness and should be made to work better.

Teachers also need renewal, and staff exchange programs are favoured.

Lifelong learning, employers making it possible for employees to return to school, education for lateral movement are all very important — attitude changes are needed by students, employers, and educational institutions.

Better and more joint human resource planning is needed, to ensure production of graduates "in advance of their times."

"We must think strategically — together."

Education should be more of a continuum from high school to college to university — and throughout one's life.

Far more second language training is needed — for the workplace, for the 'training of the brain,' and for Canada's competitiveness as the world shrinks.

In summary, this group wants to see a college system which produces consistently excellent graduates who are well-rounded and able to learn. They want this to be a joint cooperative effort between employers and colleges. "The changing economy needs more, not less, education."

Focus Group #3

Industry

June 6, 1989, at General Motors, London

Participants:

Douglas Barber	President, Gennum Corp., Burlington (manufacturer of integrated circuits)
Don Burt	Human Resources, Petro-Canada (central)
Gordon Fox	Personnel Manager, Dupont Canada Inc., Ajax
Ed Glover	President (owner), Ensign Tool & Die, Windsor
Roy James	Training Counsellor, Domtar Inc., Toronto
Robert Milbourn	Vice President Manufacturing, Stelco Steel, Hamilton
Boyd Neil	Director Human Resources Development, Society of the Plastics Industry, Don Mills
Charles Schmidt	Manager Human Resources, 3M Canada Inc., London
Heather Wade	Personnel, GM Diesel Division, London
Bev Wright	Training Coordinator, Davidson Instruments, Port Hope
Bill Wright	Director Employee Relations, Stelco Steel

[sitting in and responding: Barry Moore, President, Fanshaw College; and Janet Mason, Ministry of Skills Development]

Facilitator:	Bob Siskind, lawyer, London
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller
Host:	Tayce Wakefield, General Motors

Focus Group #3 — Industry

1. Current Skills Situation

Participants all spoke of serious skill shortages. Their most urgent need is skills' upgrading, but there are also serious problems at the first job level.

There was unanimous and strong agreement that generic skills are seriously lacking — literacy and numeracy basic skills, as well as the "soft" skills of people-handling and leadership.

"We can't afford to hire illiterates," was one person's summary. Another had to establish high school core courses on the job site in order to facilitate skills' upgrading training.

As responsibility is being pushed further and further down into the workforce, people are not able to handle it — leadership and understanding of the workplace is lacking, as well as broad general knowledge about society and the economy.

Much of the blame is placed on the high schools and the public schools, but the colleges are criticized for lowering their entry standards and teaching trades to illiterate people.

The colleges are also viewed as key to helping solve the problems in the near and long-term future.

Lifelong learning abilities are urgently needed, "but it has been talked about for years and nothing improves."

Standards are needed — even across the country would be useful — "We don't know what we're getting."

2. Where Should Skills Training Occur?

"Business has to take more responsibility, and colleges have to be more creative."

The consensus was that business has the responsibility to do a lot of training, but they need help — "We need the colleges, we don't train well ourselves."

One-week courses on new machinery is better done on the job site, but colleges can help there as well, with flexible instructors who can come in for the short courses — "They aren't paying attention to our needs, and we're willing to pay for it."

And business needs to pay more attention to the colleges — work with them on program development and future labour force needs.

The colleges are looked to for the generic skills and general knowledge — for "education." Industry should do a lot of "training," but colleges have a significant role there too. There is not a conflict between the demand for "educated" and "trained" people.

The division between colleges and universities is too sharp, and colleges suffer from the low regard for trades and from being viewed as trade schools.

"The blue-collar world has changed, and more value has to be put on trades."

The colleges can play a major role in driving the future of Ontario — growth does not need to be all in the service sector if the attitudes and training improve.

The colleges have a big role to play in changing attitudes towards learning — as lifelong — and towards work.

When asked about the idea of a grant/levy, or training tax, the response was negative to the idea of paying more tax: "We already pay too much"; "Simplistic, won't work"; "Will scare investment away." At the same time, participants had expressed the need for greater commitment by employers, remedies for poaching trained workers, and incentives for smaller employers. They said they were willing to pay for training.

In summary, the lack of skills is serious, and the solution lies in a much closer college/business partnership which, in itself, needs consistency and system-wide coordination.

Focus Group #4

Information and Communication Technologies

June 16, 1989, at Centennial College, Scarborough

Participants:

Robert Arn	Sponsor; President, Educational Software Products, Meridian Technologies
Ray Deaust	Personnel operations manager, IBM Canada
Penny Dickens	Writers' Union
Arthur Donner	Toronto Star columnist
Penny Grows	Canadian Book Publishers Council; McClelland & Stewart
Joe Koenig	President, Interactive Image Technologies
Ron Kraft	Vice President Marketing, Unisys Canada (software)
Mike Lupiano	Human resources, Cognos (software)
John McCullough	CKVR TV, Barrie
Ian McPhee	President & CEO, The Watcom Group (software)
Clive Smith	Vice President Creative, (Bearspots) Nelvana (animation house)

[Sitting in and responding: Hugh Armstrong, Centennial College]

Facilitator:	Tim Reid
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller

Focus Group #4 — Information and Communication Technologies

1. Implications of the New Technologies

[It was noted that participants in this group contribute to, as well as consume, education.]

"The new technologies will transform the delivery of education whether desired or not — distance education by technology."

The need for lifelong learning is even more intense — people in all fields, but especially in communications technologies, have to learn new technologies every couple of years. "The commitment to lifelong learning is lacking in Canada and is handicapping our people and our competitiveness."

The college instructors are not keeping up with the pace of change — they must take periods in the workplace, through sabbaticals or exchanges, and be committed to lifelong learning for themselves. The large employers are interested in developing such relationships and looking at joint ventures and partnering as well — "We want to work together with the colleges and their faculty."

The smaller employers cannot train and retrain, and they need the colleges. "The colleges should try to better fill the gap in retraining needs."

The cooperative program approach was viewed with favour as a benefit to both students and employers.

All the participants talked about the need for **flexibility** in all areas — the teachers, transferability of credits, credentials criteria, and in course content and time frames — to meet the varying needs of high school graduates and mature students, full-time and part-time study, etc. Both the students and the employers need this flexibility from the institutional side (including the universities).

The new technologies are demanding a new kind of graduate — again the key is flexibility. This translates into the need for graduates with excellent writing and numeracy skills, honed analytical skills, the ability to think, and to continue learning. Marketing and administrative skills, as well as social skills and working-with-people skills, are needed as well. The current graduates are mostly lacking in all these skills.

"There is a powerful role for the colleges in our sector. Don't teach how to operate XYZ machine; teach them the fundamentals in writing, math, and science; and teach them to learn; and prepare them to have to learn and learn again throughout their lifetimes."

2. The Universities and the Colleges

Discussion of the relative roles of universities and colleges and their relationship was extensive.

The view was stated by some, but not unanimously held, that the universities were perhaps the better places to teach people "to think," and that the colleges should cover core courses and such sector-wide needs as basic electronics, and basic use of machines. One employer stated he needs skills in writing and mathematics which are beyond the current university level.

The other aspect of this discussion was that there is a distinct niche for the colleges, but not if they are relegated to second place. The niche must be found and promoted — business needs to know much more about the colleges. "The role of the colleges is to make high school graduates functional in the work world," was one statement.

The key point made, unanimously, was the need for flexibility again. "The current rigidity of institutions is deadening." Credits should be able to be transferred between universities and colleges, with consideration given to credits for industry training as well; credentials are needed but must be redesigned.

Colleges and universities should look at colleges creating both university feeder programs (for example, as the CEGEPs in Quebec), and post-university specialist programs. The example in publishing was given, where the best recruits are university graduates who have then taken a skill-specific program at a college.

There was clear support for the public role in education and training, and for the need to make 'system-wide' responses possible.

One person's summary was generally agreed to: There is a "crisis" in education: The birthrate is dropping; the population is aging; the current workforce must be regarded as the future workforce; immigrants must be trained better; technology is changing rapidly; the rate of change is accelerating; and competition is fierce. "In this situation people have to perform better. If you don't have a flexible workforce, you don't have a business."

Focus Group #5

Associations

June 20, 1989, at Humber College, Rexdale

Participants:

Jim Bennett	Sponsor; Vice President, Canadian Federation of Independent Business
Bob Crow	Director of Research, Information Technology Association of Canada
Ken Graydon	Federation of Automobile Dealer Associations of Canada
Leo Normandeau	Director Educational Services, Canadian Life and Health Association
Leo Podetz	Municipal Electrical Association and Canadian Association Executives
Peter Woolford	Senior Vice President, Retail Council of Canada

Facilitator:	Roy Giroux, Humber College
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller
Hosts, participants:	Humber College: Kris Gataveckas, Erin Hamilton and Bill Sinnett

Focus Group #5 — Associations

1. General Comments

This was an extremely knowledgeable group of participants who are all involved in education and training in their sector. Most of the sectors represented do a large amount of internal training and many said their members do not know what the colleges have to offer — that the colleges have done a very poor job of marketing themselves.

There was support for the colleges also marketing the value of education and training. An example given was the retail sector "which does not train," and which should be shown the advantages of the colleges.

The colleges have a credibility/image problem which is seen to be mostly unjustified and was attributed to poor communications with business and, therefore, ignorance of the system. The 'hierarchy' in education, with the universities called the 'higher' level, has contributed to the colleges' problems.

The participants showed strong support for the concept of the colleges and urged them to lobby with industry and commerce to garner support for putting pressure on government for better funding.

"Colleges are the core of the education system where people can go in and out over their lifetimes. They are doing well in adult and continuing education and should expand it."

2. What Should the Colleges be Doing?

"The colleges have the opportunity and the responsibility to give individuals the skills needed to retrain themselves on the job. Students have to understand that the nature of work is changing, and they must adapt to changing technologies; and this should be done in the formal education setting before entering the workforce."

There was agreement that the colleges should be providing both general education and fulfilling the polytechnical function. There was disagreement on whether the colleges should continue to offer such a wide range of courses, or whether they should concentrate on 'niche marketing' and creating areas of specialization.

There was also agreement that the current graduates do not have the generic skills needed for the changing economy — "the basic skills of numeracy, literacy, and the ability to think, along with work-related skills. The balance needs to be struck." It was noted that this balance is different for each sector.

Closer links must be established between business and colleges — active advisory committees and cooperative programs were mentioned as positive linkage mechanisms.

When asked about **standards**, one participant commented that the business community would react favourably to a general set of standards across the country — where employers knew the basic skills level on graduation. Two others commented that it was very difficult to do, and that, if the business sector is in touch, the standards will be known — "the graduates are the best measure of the quality of education." The business sectors can help establish standards.

In this context, concern over homogeneity was expressed, with several participants supporting the close community links of the colleges — letting them evolve their own identities. This means there will be a wide range of standards.

It was noted that, with many universities and some colleges just beginning to offer financial planning programs, the opportunity should be taken to bring employers together with the institutions and develop agreement on standards and certification. In this context, it was commented that there should be college/university linkages and portability of credits.

There was discussion over whether the public service role of the colleges — in offering basic literacy and numeracy, ESL, targeted programs for the disadvantaged, etc. — was in conflict with the need to respond to employers' needs. Both roles were essentially supported, and a balance should be sought.

Focus Group #6

Social Service Agencies

June 22, 1989, at the Social Planning Council of Metro Toronto

Participants:

Joan Annis	Ministry of Community and Social Services, Employment Support Initiative (joint program with Metro Toronto)
David Kidd	Central Neighbourhood House (student placements, community-based training)
David Lam	Metro Toronto Social Services, Employment Support Initiative (joint program with the province)
Anna Maria Menozzi	Working Skills Centre (immigrant women)
Susan Pigott	Family Services Association of Metro Toronto
Franc Riggio	Aspire, Metro Toronto Social Services
Carol Rowntree	Consultant in community-based training programs; Member of the Board, Social Planning Council
Sue Stone	Employment Programs, Metro Toronto Social Services
Wendy Terry	Workers Educational Association (NGO)
Thomas Vegh	Parachute (community employment centre)
Brenda Wall	Metro Labour Education Centre (unionized workers)

[sitting in and responding: John Huot, Humber College teaching master in social services]

Facilitator:	Roy Giroux, Humber
Rapporteur:	Audrey Gill
Council of Regents:	Craig McFadyen
Host, participant:	Armine Yalnizyan, Program Director, Social Planning Council

Focus Group #6 — Social Service Agencies

1. A Learner-Driven System

This focus group was very clear and strong in stating their opinion that the colleges are too concerned with meeting the needs of employers while ignoring the needs of the students. One participant said, "The colleges should be advocates for the learner, not just a locus for delivery of education."

A learner-driven system was defined as one which would reduce barriers of all kinds, provide equal access through such means as support systems, break down rigidities in and between institutions, educate for mobility and flexibility, and provide quality education and training.

1. **Support systems** include: Financial assistance, such as reducing costs of programs and income support during education; child care; better counselling; and assistance in linking to other needs and services.

The latter was described as a 'one-stop-shopping' system to assist students in accessing the range of education and support services available, making the connections for them. It was a strong recommendation of the group that such a centre be established.

2. **Upgrading** was identified as an area where barriers need to be broken down. The colleges are best positioned to deal with problems of high school drop-outs, through such means as recognition of credits, not "equivalents"; closer involvement of the colleges in apprenticeship programs to make them more flexible; reaching out to the Grade 10 leavers who go to work and then want more education; counselling geared to adult students; and flexibility in programs to allow people to work and go to school at the same time — "making lifelong learning possible."

3. The colleges must meet the **needs of the culturally diverse** population better. With the indications that economic growth will be in the service sector, those employees will be drawn from women, Native peoples, and immigrants of diverse ethnic origin. ESL courses are only to the grade 6 level, whereas other courses they want and need to take require a grade 11 level. Communication with the parents is needed, since in many cultures the parents determine the route of study for the children. "People are 'selected out' administratively, especially immigrant women — the colleges have been extremely rigid."

4. **Institutional barriers** are extensive — the education system should be looked at as a whole from grade 1 up, and more integration is needed — "learners don't care about turf!" Credits must be portable. The colleges and universities, and the colleges and high schools, should cooperate much more to provide more flexibility and mobility for learners. "There is a need for master planning across all institutions — greater integration will provide more choice and flexibility."

   Not only do programs, credentials, and services need cross-institutional coordination, but there is also confusion and serious gaps on the funding side. The problems are growing worse as the federal government is "tearing apart human resource development in this country." Funding is being redirected to business and away from the student and the public institutions.

5. **Quality education** was defined as providing generic skills, analytical skills, socialization skills, preparation for job seeking and an understanding of the marketplace, and Canadian history and politics "so people can participate in life." Lifelong learning must be instilled as an "attitude." The necessary flexibility in institutional structures and programs should be provided.

2. What Can be Done

There was strong support for public, rather than private, education. The colleges have a major role in the economy, which should be focused on the learner: "We limit our economic expansion if we stunt our labour force growth in skills."

Colleges can be more anticipatory of economic needs, indicate where economic growth will come, and provide programs in those areas. The examples given were waste disposal, and variety of services and more training in geriatrics, which will be required by the aging population.

Social service jobs are crucial, and the colleges can help by expanding the training of para-professionals. They could also work closer with agencies, providing organizational skills and reducing the need for expensive consultants.

Colleges can assist in small business development by teaching people about self-employment and mentoring on financing.

Colleges can help change the poor image of blue-collar work, which will assist workers.

Cooperative programs are viewed as useful in helping students understand the work world while they are still in a learning situation.

Colleges must maintain their connections to the community and play a role in community development.

It was agreed that the natural allies of the colleges, community-based agencies, and labour should band together to lobby for more support for education and against privatization of education.

Focus Group #7

Trade Unions

June 26, 1989, at the Ontario Federation of Labour, Toronto

Participants:

Julie Davies	Secretary-Treasurer, Ontario Federation of Labour (responsible for education)
Jay Jackson	Ontario Public Service Employees' Union
Jim Turk	Director of Education, Ontario Federation of Labour
Sue Yates	United Food and Commercial Workers Union

Facilitator:	John Huot, Humber College
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller

Focus Group #7 — Trade Unions

Vision 2000 has been extensively discussed by about 15 unions through the Ontario Federation of Labour (OFL) Education Committee. Their consensus of what they want to say about how the colleges should function in the future was conveyed through the representatives at this meeting on June 26.

1. General Observations

a) It is considered essential that the students be seen as the clients of the colleges — that the colleges must serve both the short and long-term needs of students, not of employers.

b) Colleges should be distinct educational institutions — not feeders to universities nor service to business. The integrity that is there now should be built on.

c) It is essential that training and retraining provide a broader and more foundational quality education.

d) The bias should be to prepare people for their lives, both short and long-term. This requires a mix of general and specific education and training which should equip them with skills needed for the labour market and for the rest of their lives.

Most private-sector training does not do this. It tends to focus on the immediate and narrow job skills and usually fails to make job specific training more generally useful to the worker. Despite these failings, private-sector training is often very expensive. Job-related skills training should be carried out in conjunction with the colleges. When colleges undertake employer-specific training on behalf of a particular firm or other client, it should be on a cost-recovery basis for the college.

2. Specific Points

Lifelong learning means different things to employers from what it means to labour. Employers think of people being 'retooled' as they need to learn a new machine. Employees understand they need to be able to learn throughout their lifetime. Apprenticeship is a good model for skilled trades training, because it gives a broader understanding of many things.

Credentials: There needs to be more consistency in giving credit, and the credits should be easily portable between colleges.

Labour's view is that business has too great an influence in **planning**, and that labour should participate on a parity basis with business. Community representatives and college staff should be the third and fourth groups, with equal representation. Some feel boards should be elected as local school boards are. The college boards are business-biased and not really serious about genuine community involvement.

A province-wide system is recommended — in order to provide better access for all people, to make the colleges accountable to the whole community (not just to business and labour). It should be a province-wide system with some local autonomy, to allow for better responsiveness to the communities. If there was province-wide consultation, the labour and community input would be more meaningful, and better institutional access would result.

Broader access is a serious issue — "with universities cutting back, more middle and upper-class students are taking college spaces at the expense of working class students." The colleges have a major role to play in encouraging and facilitating broad attendance from across class lines.

Labour-market planning has not been very successful — there is little accuracy in the sectorial projections. This means colleges cannot set policies based on these projections — "Colleges cannot be swayed by whims of the sectorial winds." They need to provide basic education which allows flexibility in responding to short-term sectorial demands.

When asked about **specific services** colleges could provide to labour, the response is that labour wishes to participate in developing content for labour-studies courses. Labour wishes to continue to provide education for its own members as well.

Colleges can and should act as **advocates** — for example, for affirmative action. They should also act as model employers. Since they are public institutions, they have a social obligation to serve all of society. College presidents are too biased towards business — they should be accountable to reformed boards. Colleges should develop a collective voice to play a significant role in quality issues.

Focus Group #8

Financial Sector

June 26, 1989, at Ryerson Polytechnical Institute, Toronto

Participants:

Laurie Badali	Training coordinator, Royal Insurance Canada
Laura Gallant	Manager Recruiting, Sun Life Assurance Company of Canada
Michael Joyce	Executive Management Development, Canadian Imperial Bank of Commerce
Dan Marmash	Vice President Compensation, Royal Trustco
John Pare	Senior Vice President Human Resources, Central Guaranty Trustco Ltd.
Sheila Wharton	Manager – Human Resources, Montreal Trustco

[Written submission: The Manufacturers Life Insurance Company]

Facilitator:	Dr. John Frid (affiliated with McMaster University and Mohawk College)
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller
Host, participant:	Milton Orris, Dean Continuing Education, Ryerson

Focus Group #8 _ Financial Sector

1. Profile of Types of Employees Needed

The participants in this focus group were very experienced human resource officers; some with 25 years in the field.

There are serious shortages of skilled employees in the financial sector — not all attributable to the Toronto-specific problems — and extensive poaching is going on.

The shift in approach in the financial sector — from 'processing' to 'servicing' — is opening up an entirely new milieu. The need is for a good generic skill base — English and general technical skills — and for greatly improved interpersonal skills. "Technical competency in an individual's field or profession is now considered a basic ingredient. More crucial today are a person's skills in the management of people — not just task completion but also leadership."

The generic skills are lacking in graduates from high school, college, and university. The ability to communicate in written and oral English is a serious deficiency. Another need is for generic technical knowledge, which allows the employee to use the new technologies and easily upgrade and move with the rapid changes. "Information technologies are impacting on literally every job, and the skill base is lacking."

Employers are encountering serious problems on the attitudinal side. They need recruits who are able to learn over a lifetime, who are flexible, able to manage change, make decisions, and take responsibility and initiative — and are finding that graduates do not have these attitudes. "Employers are far more concerned about the whole person than in the past."

2. The 'System'

These employers recruit mostly from the universities, but are looking more often to the colleges to find the clerical, computer, and accounting staffs they need. "College graduates stay longer with the company."

But they find it very difficult to deal with college graduates because there are not common exit standards and "we don't know what we're getting." The time required to research each college's programs as well as individual teachers makes it difficult and, therefore, less likely they will recruit at the colleges. "We need common exit standards and credentials."

The teachers who have real business experience are producing far more valuable graduates — the teachers must keep up to date and take time in business.

"Massive retraining" is needed because of changes in the business (CIBC is retraining 29,000 employees at the moment). The education system does not respond quickly enough to these needs — although there is a niche for the colleges in this area.

"The process of education is continuous; therefore, colleges should focus on the needs of the continuing education student — counselling, re-entry to the learning process, accessibility, and quality of instruction."

There was agreement that business has to continue to contribute to training and retraining. Some are involved with the universities' cooperative programs and find it a useful way for business and education to work together. "The colleges have to get industry to 'buy in.'"

As well: "The colleges have a responsibility to encourage and educate target group members. As an organization, we are committed to employment equity, and demographic projections also indicate there will be greater opportunities for women, minorities, and people with disabilities. Employers should assist in the process with appropriate scholarship funds and job opportunities."

The lack of flexibility and of funding in the education system are serious problems. "Vision 2000 cannot look at professional needs in isolation — you must relate to the universities and to business."

Focus Group #9

Hospitality Sector

June 28, 1989, at George Brown Hospitality School, Toronto

Participants:

Carolyn Clark	Vice President Human Resources, CP Hotels
Ruth Cornish	Director Strategic Policy Branch, Ontario Ministry of Tourism and Recreation
Bernd Gabel	Food and Beverage Director, Metro Toronto Convention Centre
Cameron Hawkins	Vice President Acquisitions and Development, The Bitove Corp. (caterers)
Jamie Kennedy	Chef and Owner of Palmerston Restaurant
Dale McNichol	Vice President, Blue Mountain Resorts
Peter Meyer	Director Human Resources, Marriott Food Service Management
Douglas Needham	President, Canadian Restaurant and Food Services Association
Jorg Reichert	President, Movenpick Restaurant
Gary Stewart	Stewart Travel, Peterborough
Art Ward	Resort Owner: Wigamog Inn, Haliburton

Facilitator:	Tim Reid
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller and Craig McFadyen
Sponsor, participant:	Peter Elmhirst, Peterborough Resort Owner; President, Tourism Ontario
Host, participant:	Brian Cooper, Chair, Hospitality Division, George Brown College, Toronto

Focus Group #9 — Hospitality Sector

1. Hospitality Industry and Training

The industry recognizes that it does very little training, and that more is needed. It also recognizes it needs to improve as an employer — in pay, working conditions, and training.

The industry must be promoted as a career, not a temporary job, in both high schools and colleges — and the colleges can play a significant role. Since it is a fast-growing industry, the need for better skilled people is important to maximize its economic contribution; and people who are going to stay long-term are worth training. (The shortage of labour in Metro Toronto is so severe, "we'll take anybody off the street".)

Apprenticeship: There was extensive discussion of whether apprenticeship is the best training system for the industry, and there is not agreement on the question. One called it "the true companion with colleges and the industry." Others said it doesn't work because employers treat apprentices as cheap labour and don't give any training. "Sticking an apprentice in a steak house for his whole term isn't going to do anything for him." And, "The European way doesn't work here — even the term is outmoded and doesn't attract students."

Several, especially the resorts, believe that a structured, well-managed, cooperative system would serve both students and employers best. "We need to be able to designate specific jobs as co-op jobs and be assured that we will always have a co-op student coming into that job. Then we are willing and able to train properly."

2. The College System

"The colleges should decide what they are doing with the management training — producing the middle or the top managers. Employers need to know what to expect from a college graduate."

There was agreement that standards and credentials and transferability are needed. Flexibility by the colleges is very important. Although some have found them very helpful, others have not. A clear example was, "Don't pull them back to school in September, which is now a big month." An extended summer work experience, from May to October, is very useful — although it was noted that the season is now almost year-round in many parts. Teachers should also do work experience as they often have none, or are out of date. The colleges have problems with staying current in general.

It was noted that the colleges are not training on the reservations technology which is 60% of the work day in the travel agency business.

Most participants agreed on the need for generic skills, excellent interpersonal skills, being trained for 'service', broad management training, basic computer knowledge, ability to handle change. One dissenting voice said, "Don't teach them a million other things; teach them what they need to know."

It was stated that the colleges are poor at marketing themselves. It was agreed that they do have a major role to play with the hospitality industry and could fulfill the needs in a bigger and better way, working with the industry. (One example: The Chinese Restaurant Association trains, with the college participating).

A proposal was made to do a pilot project with a national organization, one college, and employers — to create modular programs, establish standards, etc. "We would like to see a national standards manual which employers could refer to as well."

Focus Paper #10

Construction Trades Employers

June 29, 1989, at Algonquin College Woodroffe Campus, Ottawa

Participants:

John Devries	Electrical Contractors' Association
Jack Donovan	Chair, Ottawa Construction Association (owns a drywall firm)
Valerie Fergusson	President, Holmes Heating Inc.
Mrs. M. Holitzner	M. Holitzner Ltd. (general contractor)
Mark Small	PFC Mechanical Contractors Ltd.
Michael Smith	Area Manager, Ellis Don Construction

Facilitator/Host:	Bill Conrod, Vice President Continuing Education, Algonquin College
Rapporteur:	Audrey Gill
Council of Regents:	Riel Miller
Sponsor (non-participating):	Philip Killeen, President, Algonquin College

Focus Group #10 — Construction Trades Employers

The construction industry is the largest employer in the province, and it faces serious skilled labour shortages. Parents want their children to go to university, and the industry gets the school drop-outs. The industry, working with the colleges, is the best way to try to attract people and to promote it as a stable and well-paying career. "The good superintendent is a dying breed."

Apprenticeship is the main source of new employees, but the unions are keeping down the numbers of new entrants. A structured and well-managed **cooperative system** is favoured and should be studied.

Employers want the colleges to teach some **generic skills** (which the employers find are seriously lacking these days), including better interpersonal skills. On-the-job training will always be necessary for the hands-on training, but they want a good all-round college graduate. "The colleges should do the theoretical teaching, and we'll do the nuts and bolts."

To these employers, this includes **attitudes towards work** — "They have no work ethic." The education system is looked to for inculcating attitudes of responsibility and motivation to work.

Continuing education is needed for skills upgrading or changing, but it is difficult to motivate as employees are too tired to go to school at night while working. Most employers would be willing to contribute to making it financially feasible to do upgrading in blocks if they thought they could keep their employees, but the extreme mobility in the industry means employers are reluctant to spend a lot on training. Again, colleges could help with attitudes of commitment, and industry could help by making commitments too. The colleges could also move aggressively to provide trades retraining when plants close down. Credits for experience should be looked at.

The quality of teachers is a problem, but the participants were unsure whether they could provide work experience for teachers. They would like to work with the teachers on curriculum, however. (One participant is a member of a program advisory committee at Algonquin and finds it valuable.)

"The labour-intensive nature of the industry will continue. More people are needed, and working with the colleges is the best way." A province-wide college system, working with the province-wide industry association, is viewed with favour.

[It is noted that there are many similarities between the needs and problems of the hospitality and construction industries.]

Focus Group #11

Francophones in Business

June 29, 1989, at Algonquin College Rideau Campus, Ottawa

Participants:

Guy Dalbec	Mitel Corp.
Serge Desjardins	Minto Construction
Pierre Glaude	President, Comite d'aide au developpement des collectivities de Prescott-Russell
Andre Gravelle	J.C. Gauthier et Associes (assurance)
Denis Lafreniere	Revenue Canada, impot
Diane Pelletier	Commissaire industrielle, Hawkesbury
Monique Piche	Monique Piche & Associes Inc.
John Umiastowski	Dustbane Enterprises

[sitting in: Diane Joanisse, Algonquin College Francophone Consultative Committee]

Facilitator & Host:	Jacqueline Robertson
Rapporteur:	Riel Miller (Audrey Gill in attendance)

Focus Group #11 — Francophones in Business

Some of the employers mentioned that they used the college for more advanced training of managers. In general, participants felt that salespeople and secretaries needed computer skills and top notch writing skills. This need was particularly acute for Francophone business. In this context, short modular courses which could be accumulated were seen as being an effective solution. There was overall agreement that academic standards, ease of transfer, and clear credit for courses should all be enhanced. **Modular systems** with continuous admissions in basic education and upgrading were endorsed by the group.

Participants expressed a strong concern that colleges offer effective **retraining and upgrading** courses, programs, and credential paths. This was seen as involving a break from the usual pattern of continuing education courses, which were viewed as often ill-suited to the needs of adult learners. In particular, courses and credentials need to be geared to the upgrading of skills which adult workers need. Access and high levels of participation for these adult retraining students was seen as being realized through flexible, intensive, and incrementally-credited programs. To summarize, there was considerable emphasis by participants on putting the notion of lifelong learning into practice with a special emphasis on access.

A number of participants noted that they face labour shortages. They pointed out that colleges should play a role in promoting careers with good job prospects.

In terms of instructional methods, there was widespread support for various forms of well supervised and tightly structured **cooperative education**. Focus group participants felt that the mixture of practical and theoretical experience served student and employers quite effectively. For students, co-op programs offer a clear sense of the work world, and, for employers, co-op students already have a track record.

Accessibility takes on very specific dimensions when it comes to the Franco-Ontarian community. Many small scale Francophone enterprises would use training programs offered by colleges if the teachers could come to the business and design the courses to fit their needs. "Naturally employers should pay for the services rendered." Another element of access relates to giving credit and credentials for every investment made by students. This is particularly important for many of Ontario's Francophones, who tend to undervalue education.

In discussing the balance between general or common course content and localized or industry specific instruction, the general view was that there should be a 75/25 split. Reference was made to a number of studies done in Quebec which recommended and subsequently implemented this approach.

Another innovation already being practised in Quebec relates to **applied research** and the assistance which colleges can offer for regional development plans. Participants saw no reason why colleges should not engage in joint research efforts with local businesses as part of an overall strategy to promote community development. Indeed, they pushed the concept further by suggesting that the colleges should be tied in to all aspects of regional economic and social planning. As it stands, colleges were seen to be working with the unemployed, but the participants felt there should be a much more proactive role, with the colleges acting as a "motor of development."

Excellence was raised as an issue which colleges must be concerned about. A participant noted that without paying attention to excellence, the colleges could expect many clients to look for other suppliers.

Finally, there was considerable support for the need to design colleges to be **responsive on a regional basis**. As was noted, this is consistent with the Plan Directeur which was prepared by CEFO.

Focus Group #12

Northern Region/Resource Sector

July 4, 1989, at Racicot, Bonny, Aube & Gauthier law firm, Timmins

Participants:

Enzo Altobelli	President, Kapuskasing Labour Council; President, Canadian Paperworkers' Union, Local 89
Doug Clute	Ministry of Northern Development & Mines, Regional Development Coordinator, Sault Ste. Marie
Peter Goth	Manager, North Claybelt Community Futures, Kapuskasing
Mike Gubbels	Plant Engineer, Dome Mines, Timmins
Gerry O'Connor	Kirkland Lake Economic Development Association; Chairman of the Board, Northern College
John Pappone	Manager Employee Relations, Kidd Creek Mines
Bruce Pollard	Ministry of Northern Development & Mines, Policy Analyst, Sudbury
Danny Ryan	Human Resources Manager, Malette Waferboard (pulp mill)
Peter Smith	President, Heathwood Engineering (lumber)

Facilitator:	Robert Gervais, President, Northern College
Rapporteur:	Audrey Gill
Council of Regents:	Craig McFadyen
Sponsor (non-participating):	Louise Gauthier

Focus Group #12 — Northern Region/Resource Sector

The participants in this focus group are all extensively involved in human resource development and connected to various training programs, with the exception of the Ministry staff who are connected indirectly.

The distinctiveness of the North which affects the colleges are:

(a) Two official languages are used more than in the South;

(b) Demographics: A large Native population, and young people leaving;

(c) Regional variations within the North itself.

1. The Industry Needs in Skilled Labour

There are three different levels of needs in the North:

- Large industry which wants basic education provided, and they are willing to do their own on-the-job training

- Medium-sized companies which need more skills taught
- Small business which need a broad range of education and training to be taught by the colleges.

There is a serious lack of generic skills, which are hampering retraining in both the current labour force and recent graduates. Many mill and mine workers do not have high school, but they need basic literacy and numeracy skills to be retrained and to be trained in such things as WHMIS.

As an example, WHMIS training is costing the employers a lot of money. There is resentment that there has not been cross-ministry coordination: "Why didn't the Ministry of Labour coordinate the training through the colleges? It is an inefficient use of scarce resources. At least the trainers could have been trained by the colleges."

Business is looking for flexibility in the curriculum; provincial certification in trades; portable skills; training in small business operation; basic retraining (including computer skills); and distance education. It was thought that interactive learning on personal computers would be useful to industry's needs

Many are starting cross-trades training to improve productivity in mines and pulp mills. There is a greater need than before for people to know more and to be able learn throughout their working life. It was agreed industry, should give the colleges more guidelines on their needs. Many businesses would welcome college teachers coming on the job site to train on equipment.

Cooperative programs are fine, "as long as we don't have to become educational institutions. We haven't time to fill out all those work reports."

2. The Colleges

The colleges have a large role in the North and a great deal of influence. "We hire directly, we train, and we send people back to school — the colleges are integral to our business."

They already contribute, but could do a lot more, to assist in economic development. In particular, teaching for small business was viewed as important in order to diversify the North's economy and to expand markets, because the North is too small a market on its own.

Business and college links are quite extensive, especially through apprenticeship programs, but need to be enhanced. The colleges should "educate the whole person," and business should do direct training.

Upgrading and retraining are key, and the needs are not being met very well. College and industry can easily cooperate to improve in this area.

The colleges have a social role to appeal to individuals who drop out and get them back into the education system. There is concern about the lack of coordination between the literacy programs of the high schools and the unions, and that the colleges are being left out when they are the most appropriate places to educate adults. "The government is funding the OFL and community groups, while cutting back on the colleges — it's crazy!"

The government is also sending people out of the region to be educated, which further depletes the North's human resources. Program development should be shared between government and industry and labour — focused on the special needs of the North. "Everybody will cooperate because they realize how important job skills are to security," said a union participant. There was a strong demand for a reduction in the number of ministries which business has to deal with on training.

There is also concern about teachers and counsellors who don't know the processes and circumstances of industry. The participants are interested in staff exchanges.

The colleges need to develop closer links to the community, "to see the real world," so they can understand local needs better. One participant commented that colleges have been asking for labour needs projections, which are impossible to predict in the cyclical mining and forestry industries.

"General skills level must be increased — it must become a major priority of government if Canada is to be competitive."